The Cannabis Use Disorder Identification Test – Revised (CUDIT-R): Categorisation and Interpretation

Sophie Marshall

School of Psychology

University of Tasmania

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Statement

I declare that this thesis is my own work and that, to the best of my knowledge and belief, it does not contain material from published sources without proper acknowledgement, nor does it contain material which has been accepted for the award of any other higher degree or graduate diploma in any university.

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Abstract

The Cannabis Use Identification Test-Revised (CUDIT-R) is a brief cannabis misuse-screening tool, which is widely used to identify cannabis use problems. The CUDIT-R is widely accepted and psychometrically reliable within a clinical population. However, it is unclear if these same cut-offs are applicable in a community population. Additionally, the proposed changes in the DSM-5 introduce a new classification system and severity threshold system for identifying the severity of cannabis use disorder. Accordingly, the current CUDIT-R cut-off scores will no longer mirror the DSM severity thresholds. Consequently, the current study aims to identify community based cut-off scores that are consistent with the DSM-5 cannabis use disorder severity thresholds, as well as an indication of possible psychosocial difficulties experienced at these levels of cannabis use severity.

Method and Results

The sample for analysis consisted of 310 Australian cannabis users. Receiver operating characteristics (ROCs) was the statistical procedure used to determine cut-off scores that produced maximum sensitivity and specificity, when calibrated against the DSM-IV and DSM-5 cannabis use severity thresholds, and the Severity of Dependence Scale. The results identified that a CUDIT-R cut-off of 13 was the optimal threshold for cannabis dependence (DSM-IV); a cut-off score of 9 was the optimal threshold for mild cannabis use disorder (DSM-5), a cut-off score of 13 was identified for moderate and severe cannabis use disorder (DSM-5), and finally, a SDS cut-off score of 10 was identified.

Discussion

The current study has identified community based CUDIT-R cut-off points that are consistent with the DSM-5 cannabis use disorder severity thresholds and has provided an indication of possible psychosocial difficulties experienced by cannabis users at varying CUDIT-R cut-off points, which may inform clinical intervention.

Chapter 1: Introduction

In Australia, cannabis is the most commonly used illicit drug with an estimated 1.9 million people over the age of 14 years old using cannabis in the past 12 months (Australian Institute of Health and Welfare [AIHW], 2010). Approximately 38% of Australians aged 14 years and over have tried or used cannabis at some time in their life (AIHW). The AIHW also identified that the most common frequency of use was once or twice a year (35%) and 13% of recent users reported daily cannabis use. As a result of the high prevalence and frequency of cannabis use in Australia, it is necessary that healthcare professionals have comprehensive, practical, and robust cannabis screening instruments. This allows healthcare professionals to identify the frequency and severity of use, the potential associated harms and risks, to provide more thorough assessment where required, and to implement interventions that better manage the severity of use and frequency of use where possible (Dawe, Loxton, Hides, Kavanagh, & Mattick, 2002). Targeted, routine, and opportunistic screening with early intervention for cannabis use problems has potential for enormous gains in public health (Bashford, Flett, & Copeland, 2010).

Screening instruments, such as the Cannabis Use Identification Test-Revised (CUDIT-R) have been widely used to identify cannabis use problems. The CUDIT-R has established cut-off scores that inform severity and frequency of cannabis use. However, these cut-off scores are mirrored on the current Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) substances abuse classification system, which has been updated in the DSM-5 to reflect the addictive properties of cannabis and the presence of cannabis withdrawal, which until now has not been recognised. Therefore, it is necessary to review the existing CUDIT-R cut-off scores in order to keep them consistent with the DSM.

Diagnosing Cannabis Use Disorders

Diagnosis typically involves a systematic evaluation of signs, symptoms, and laboratory data as these relate to the history of the patients present illness or condition (Roffman et al., 2006). The purpose of diagnosis is to provide the clinician with a logical basis for planning treatment and estimating prognosis (Roffman et al.). When a substance use disorder is suspected an individual requires a formal diagnosis to exclude false positive and baseline cases (Roffman et al.). The two dominant standard systems used worldwide to classify and diagnose cannabis use disorders are current versions of the DSM and the International Classification of Diseases (ICD-10) (Bashford, 2007). Both systems identify a substance use disorder with common criteria (Bashford, 2007). The ICD-10 (WHO, 2010) is used mainly outside the United States and covers the entire range of medical disorders, of which one specific section covers psychiatric disorders (Hasin et al., 2006). The ICD-10 section on psychiatric disorders includes substance use disorders (Hasin et al.). The ICD-10 diagnostic criterion defines two disorders in substance use disorders, dependence and a secondary category called harmful use. While the DSM classification system is the preferred diagnosis system in Australia, it is also important to understand the ICD classification system.

The DSM-IV (American Psychiatric Association, APS, 2004) and ICD-10 (The World Health Organisation, WHO, 2010) diagnostic criteria define two substance use disorders, namely substance dependence and a secondary category, called substance abuse in DSM-IV and harmful use in ICD-10 (Hasin, Hatzenbuehler, Keyes, & Ogburn, 2006). DSM-IV and ICD-10 also provide substance-specific intoxication and withdrawal symptoms, and methods for diagnosing substance-induced psychiatric disorder (Hasin et al.). Each system requires at least three criteria to be met in order to diagnose dependence, and co-occurrence of criteria over a 12-month period. The DSM-IV and ICD-10 criteria for substance dependence are

similar, and include criteria for tolerance, withdrawal, continued use despite problems and various indicators of impaired control (see Table 1, Hasin et al.). Specifically, both systems identify tolerance as a need for increased amounts to achieve desired effects and both identify withdrawal as involving taking a substance to relieve or avoid withdrawal symptoms. Additionally, both systems identify impaired control, neglect of activities, time spent in substance-related activities, and continued use despite problems as dependence criteria. However, the ICD-10 identifies a physiological withdrawal state and compulsions whereas the DSM-IV does not. The DSM-IV identifies cannabis abuse in more depth than the ICD-10. The main difference between the two diagnoses is that 'desire or sense of compulsion to smoke' is an ICD- 10 criterion, but is not stated directly in DSM-IV (for a full review see Hasin et al., 2006). However, this is likely to change with the proposed revisions in the DSM-5.

Table 1

Comparisons Between the ICD-10 and DSM-IV

Dependence	ICD-10	DSM-IV
Clustering criteria	(a) Three or more of the following six symptoms occurring together for at least one month, or if <one month, occurring together repeatedly within a 12 month period.	(a) A maladaptive pattern of substance use, leading to clinical significant impairment or distress as manifested by three or more of the following seven symptoms occurring in the same 12-month period.
Tolerance	Need for significantly increased amounts to achieve intoxication or desired effect or markedly diminished effects with continued use of the same amount of substance.	Need for markedly increased amounts of substance to achieve intoxication or desired effect, or markedly diminished effect with continued use of the same amount of substance.
Withdrawal	A physiological withdrawal state of the characteristic withdrawal syndrome for the substance, or use of the substance (or closely related) to relieve or avoid.	The characteristic withdrawal syndrome from the substance or same substance (or a closely related) is taken to relieve or avoid withdrawal symptoms.
Impaired control	Difficulties controlling use in terms of onset, termination, or levels of use; using in larger amounts or over a longer period than intended; or a persistent desire or unsuccessful efforts to reduce or control use.	Persistent desire or one or one or more unsuccessful efforts to cut back or control use. Using in larger amounts or over a longer period that the person intended.
Neglect of activities	Important alternative pleasures or interests given up or reduced because of use; or	Important social, occupational, or recreational activities given up or reduced because of use.
Time spent in substance	A great deal of time spent in activities necessary to	A great deal of time spent in activities to obtain, to

related activity	obtain or use it to recover from its effects.	use or to recover from the effects of use.
Dependence	ICD-10	DSM-IV
Compulsion	Strong desire or sense of compulsion to use.	None
Abuse	(a) (harmful use) Clear evidence that substance use contributed to physical or psychological harm, which may lead to disability/adverse consequences; (b) the nature of harm should be clearly identifiable (and specific); (c) the pattern of use has persisted for at least one month or has occurred repeatedly within a 12 month period; (d) symptoms do not meet criteria for any other mental or behavioural disorder related to substance in the same time period (except for acute intoxication).	(a) a maladaptive pattern of substance use, leading to clinically significant impairment or distress as manifested by at least one of the following occurring within a 12-month period Recurrent use of substance resulting in a failure to fulfil major role obligations at work, school, or home. Recurrent use in situations in which it is physically hazardous (e.g., driving an automobile or operating a machine when impaired by substance use) recurrent substance-related legal problems (e.g., arrest for related disorderly conduct). Continued substance use despite having persistent or recurrent social or interpersonal problems caused by or exacerbated by the effects of substance (e.g., arguments with spouse about consequences of intoxication) (b) symptoms have never met criteria for substance dependence

(Source: Hasin et al., 2006)

Cannabis and the DSM-5

The proposed DSM-5 manual intends to restructure the approach of diagnosing cannabis abuse and substance dependence by identifying four cannabis diagnoses under the heading of Cannabis Related Disorders. The purpose of diagnosis for cannabis use disorders is to provide clear descriptive categories to enable clinicians to identify presenting problems and communicate succinctly about them (Dawe et al., 2002). According to the DSM-5, Cannabis Related Disorders consists of Cannabis Use Disorder, Cannabis Intoxication, Cannabis Withdrawal, and Cannabis-Induced Disorder not otherwise classified. The identification of Cannabis Use Disorder removes the problems associated with the abuse/dependence distinction in the DSM-IV and also includes withdrawal criteria. One of the major problems the new classification system will aim to reduce is the problem with diagnostic orphans, which are sub-clinical individuals who display one or two dependence symptoms, but do not meet full diagnostic criteria for a DSM-IV cannabis abuse or dependence diagnosis. The DSM-5 diagnostic criteria for Cannabis Use Disorder are shown in Table 2a (APA, 2012).

Table 2a

The DSM-5 Diagnostic Criteria for Cannabis Use Disorder

A. A problematic pattern of cannabis use leading to clinically significant impairment or distress, as manifested by at least 2 of the following, occurring at any time in the same 12-month period:

1. Cannabis is often taken in larger amounts or over a longer period than was intended
2. There is a persistent desire or unsuccessful efforts to cut down or control cannabis use
3. A great deal of time is spent in activities necessary to obtain, use or recover from use of cannabis
4. Recurrent cannabis use resulting in a failure to fulfil major role obligations at work, school, or home (e.g., repeated absences or poor work performance; absences, suspensions, or expulsions from school; neglect of children or household)
5. Continued cannabis use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance (e.g., arguments with spouse about consequences of intoxication, parent punishment for use, loss of friends or partners)
6. Important social, occupational, or recreational activities are given up or reduced because of cannabis use
7. Recurrent cannabis use in situations in which it is physically hazardous (e.g., driving an automobile or operating a machine when impaired by use)
8. Cannabis use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance
9. Tolerance, as defined by either of the following:
    a. A need for markedly increased amounts of cannabis to achieve intoxication or desired effect
    b. Markedly diminished effect with continued use of the same amount of cannabis
10. Withdrawal, as manifested by either of the following:
    a. The characteristic withdrawal syndrome for cannabis (refer to Criteria A and B of the criteria sets for Withdrawal from the specific stimulant)
    b. The same (or a closely related) substance is taken to relieve or avoid withdrawal symptoms
11. Craving, a strong desire or urge to use cannabis

(Source: APA, 2012)

Severity of dependence is one of the most important dimensions in assessment and is crucial for intervention decisions in screening, treatment matching, and goal selection. However, severity thresholds are not included in the DSM-IV or the ICD-10. As a result of the conceptualisation of the dependence syndrome as dimensional, severity thresholds have been included in the DSM-5 diagnosis of Cannabis Use Disorder. Specifically, the DSM-5 introduces a severity scale for classifying severity of cannabis use: 0 to 1 criteria (no diagnosis); 2 to 3 criteria (Mild Cannabis Use Disorder); 4 to 5 criteria (Moderate Cannabis Use Disorder); and 6 or more criteria (Severe Cannabis Use Disorder). Severity scales (such as those proposed in the DSM-5) have been found to be effective in distinguishing the seriousness of use (Langenbucher, Morgenstern, & Miller, 1995).

The development of the severity thresholds is beneficial, as it allows for the acquisition of knowledge about the natural course of dependence and informs how the disorder may be treated (Dawe et al., 202). These severity thresholds are consistent with all the Substance Use Disorders identified in the DSM-5. The proposed cut-off scores have been shown to yield similar prevalence and high concordance in relation to the combined DSM-IV substance abuse and dependence diagnoses, while removing the problems associated with the abuse/dependence distinction, such as the problem with 'diagnostic orphans' (Degenhardt, Lynskey, Coffey, & Patton, 2002). The proposed changes may therefore be better able to identify sub-clinical cannabis related problems. Establishing thresholds beyond which cannabis use is problematic is useful for healthcare professionals as it will better enable them to provide the appropriate services and interventions to people to prevent future risk of harm from cannabis use, which may prevent escalation of further problems (Degenhardt et al., 2002).

Cannabis Withdrawal

Despite the omission of cannabis withdrawal from the DSM-IV, it has been commonly reported among non-clinical (Swift, Hall, Didcott, & Reilly, 1999; Swift, Hall, & Copeland, 2000) and clinical (Budney , Radonovich, Higgins, & Wong, 1998; Copeland, Swift, & Rees, 2000) samples of cannabis users. It has also been shown in basic neuroscience, observed in human experimental studies, including inpatient and outpatient settings (Haney, Ward, Comer, Foltin, & Fischman, 1999), precipitated in animals using a cannabinoid antagonist (Haney et al; Lichtman & Martin, 2002; Budney Vandrey, Hughes, Moore, & Bahrenburg 2007), and in epidemiological studies (Budney et al., 1998). Data from these four areas of scientific research corroborate each other and interweave fluidly to dispel the myth that cannabis is not addictive and does not result in withdrawal properties. Additionally, animal and human inpatient and outpatient studies have clearly demonstrated that withdrawal can occur following abrupt cessation of cannabis or tetrahydrocannabinol (THC) administration (Budney et al., 2007). Accordingly the DSM-5 includes criteria for Cannabis Withdraw is shown in Table 2b.

Table 2b

The DSM-5 Diagnostic Criteria for Cannabis Withdrawal

A. Cessation of cannabis use that has been heavy and prolonged (i.e., usually daily or almost daily use over a period of at least a few months. However, withdrawal symptoms have been observed among those with less frequent, but chronic use patterns)

B. Three (or more) of the following develop typically within a week after Criterion A:

1. Irritability, anger, or aggression
2. Nervousness or anxiety
3. Sleep difficulty (e.g., insomnia, disturbing dreams)
4. Decreased appetite or weight loss
5. Restlessness
6. Depressed mood
7. At least one of the following physical symptoms causing significant discomfort: stomach pain, shakiness/tremors, sweating, fever, chills, or headache

C. The symptoms in Criterion B cause clinically significant distress or impairment in social, occupational, or other important areas of functioning

D. The symptoms are not associated with another medical condition and are not better accounted for by another psychiatric disorder

(Source: APA, 2012)

Cannabis Intoxication is the third disorder identified in the DSM-5 and refers to the clinically significant maladaptive behavioural or psychological change that develops during, or shortly after cannabis use.

Cannabis Screening

While the proposed changes in the DSM-5 reduce the problems associated with diagnostic orphans and identify cannabis withdrawal as a true symptom, a diagnosis using the DSM-5 alone is time consuming and not well suited to primary medical practice or general clinical assessments. Accordingly, brief preliminary screening instruments are more practically useful in determining the early stages of cannabis related problems and cannabis

dependence (Bashford, 2007). Screening is also important as it helps identify potential sub-threshold diagnoses and points of intervention to prevent further dependence trajectory.

Screens can also be self-completed and therefore do not have to be administered by a health professional, which may inform individuals of their potential risk and motivate them to seek help if they are concerned with the result (Bashford, 2007). Therefore, it is important and necessary to have screens that can assist in screening appropriately for potential harmful use and associated risk. It is important that cannabis use cut-off scores identified on screens are comparable to the criteria and severity thresholds proposed in the DSM-5. This provides consistency in understanding the potential severity of use, and in managing the individual's use and potential psychosocial associated impacts of use.

Given the rates of cannabis use identified in the general Australian population, and the potential risks associated with cannabis use, some of the most recent research related to cannabis has focused on early problem use identification (Bashford, 2007). In a clinical setting, cannabis-screening instruments are an economic and time efficient means of identifying people who are 'at-risk' of cannabis related problems and harms prior to using more extensive diagnostic instruments (Piontek, Kraus, & Klempova, 2008). Screening does not enable a clinical diagnosis to be made or determine the complete profile of a person's psychosocial functioning, but it does help to identify individuals who may have a cannabis use problem that warrants further assessment (Bashford).

Cannabis screening is also important for early detection of cannabis use problems, as early screening can prevent the escalation of further cannabis use and related problems by providing intervention as early as possible to prevent the trajectory to further dependence and more serious and chronic harms (Bashford, Fleet, & Copland, 2010). Screening instruments are particularly useful as many cannabis users who experience cannabis related problems do

not seek treatment for their cannabis use, but alternatively seek assistance to better manage related problems, such as problems with sleep, interpersonal relationships, and mood disturbances (Bashford et al.). Therefore, if healthcare professionals are aware that these screens are available, then individuals presenting for other related problems, such as sleeping difficulties, can be screened for cannabis use problems in a brief, inexpensive, and efficient manner (Bashford, 2007).

Until recently there were few effective cannabis screens available as many of the original screens were developed on the template of existing alcohol or other drug screens. Consequently, many of these initial cannabis screens were too lengthy, complex, or otherwise unsuitable (Bashford, 2007). Fortunately the recent and ongoing development of a small range of cannabis specific screens has allowed for more effective screening of cannabis related problems (Bashford). Table 3 outlines some of the most widely used cannabis screen including, the Severity of Dependence Scale (SDS; Gossop et al., 1995); the Cannabis Use Disorders Identification Test (CUDIT; Adamson & Sellman, 2003); the Problematic Use of Marijuana (PUM; Okulicz-Kozaryn, 2007); and the Cannabis Abuse Screening Test (CAST; Legleye, Karila, Beck, & Reunaud, 2007).

It is important to note that Table 3 does not identify all cannabis screening instruments available and that there are additional scales that measure cannabis related problems, including the Marijuana Screening Inventory (MSI), the Substance Dependence Severity Scale (SDSS), and the Cannabis Problems Questionnaire (CPQ). Theses scales have been identified as more extensive and too time consuming for epidemiological purposes (Piontek et al., 2008). For a fully comprehensive overview of all cannabis screens available see, Screening and Assessment for Cannabis use Disorders (Bashford, 2007).

Table 3

Cannabis Screening Instruments

Cannabis Screen	Items	Description	Psychometric properties
SDS	5	• Valid • Reliable • Tested with adolescents, adults, and psychiatric populations • Separate norms available for adults and adolescents	• Sensitivity = 64–86%, specificity =82–94% in adults; and sensitivity = 64% and specificity =94% (cut-off = 4) in nonclinical young people.
CUDIT-R	10	• Self-report for adults • Cut-off norms available	• Sensitivity =73%; specificity = 95% • Overall positive predictive validity = 84%
PUM	8	• Self –report for youth • Assess for cannabis dependence	• Internal consistency = .92 • Sensitivity = 80.9%; specificity = 87.5%
CAST	6	• Self –report for adolescents and adults. • Validated and reliable	• Reliability: Cronbach's alpha = 0.81 • Sensitivity = 92.9%; specificity = 81.4% (cut off=4); positive predictive value = 45.8%

(Source: Copeland, Frewen, & Elkins, 2009; Legleye, 2007).

An advantage the CUDIT has over alternative screening instruments, such as the SDS, CAST and CUPIT, is that it is able to measure patterns of cannabis use and related problems (Adamson et al., 2010). The CAST is ill-served to screen for current cannabis use disorder as it enquire about lifetime use, in contrast to the focus on the past 6 months for the CUDIT and past year for the SDS (Adamson et al.). The CUDIT is widely used amongst healthcare workers in Australia. Accordingly, Adamson et al. recommends that the CUDIT be used when an instrument is required to screen for harmful and hazardous cannabis use and is identified as a preliminary step in determining the early stages of cannabis related problems and cannabis dependence during the preceding 6 months (Adamson & Sellman, 2003;

Bashford et al., 2010). To complete the CUDIT participants are required to read a statement and circle the answer, which corresponds to their pattern of use. The CUDIT can be self-administered or verbally administered by a healthcare worker. Each question is scored from 0 to 4, with an example item being "How often were you stoned for six or more hours?"

The CUDIT

The CUDIT (Adamson & Sellman, 2003, see Appendix A) is a 10-item instrument that was developed by modifying the Alcohol Use Disorders Identification Test (AUDIT, Saunders, 1993; see Table 4). The AUDIT assists practitioners to identify whether a person has hazardous (or risky) drinking, harmful drinking, or alcohol dependence (WHO, 2001). Hazardous drinking is a pattern of alcohol consumption that increases the risk of harmful consequences for the user or others (WHO). Harmful use refers to alcohol consumption that results in adverse consequences to physical and mental health (WHO). Alcohol dependence is a cluster of behavioral, cognitive, and physiological phenomena that may develop after repeated alcohol use (WHO).

The validity of the AUDIT was computed against a composite diagnosis of harmful use and dependence (WHO, 2001). In the test development samples, a cut-off value of 8 points yielded sensitivities for the AUDIT for various indices of problematic drinking that were generally in the mid 0.90's. Specificities across countries and across criteria averaged in the 0.80's on the AUDIT (WHO). In comparison to other screening tests, the AUDIT has been found to perform equally well or at a higher degree of accuracy across a wide variety of criterion measures (WHO). AUDIT scores were found to correlate well with measures of drinking consequences, attitudes toward drinking, vulnerability to alcohol dependence, negative mood states after drinking, and reasons for drinking (WHO).

Table 4

The Alcohol Use Disorders Identification Test (AUDIT)

1	How often do you have a drink containing alcohol?	Hazardous alcohol use
2	How many drinks containing alcohol do you have on a typical day when you are drinking?	Hazardous alcohol use
3	How often do you have 6+ drinks on one occasion	Hazardous alcohol use
4	How often have you found that you were not able to stop drinking once you had started?	Dependence syndrome
5	How often have you failed to do what was normally expected from you because of drinking?	Dependence syndrome
6	How often have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Dependence syndrome
7	How often have you had a feeling of guilt or remorse after drinking?	Harmful alcohol use
8	How often have you been unable to remember what happened the night before because of your drinking?	Harmful alcohol use
9	Have you or someone else been injured as a result of your drinking?	Harmful alcohol use
10	Has a friend or health worker been concerned about your drinking or suggested you cut down?	Harmful alcohol use

(Source: Saunders et al., 1993)

In translating the AUDIT for use with cannabis, item modification was done carefully to match closely the AUDIT content (Adamson & Sellman, 2003). For items 1, 4, 5, 6, 7, 9 and 10 the word "alcohol" was replaced with "cannabis". For items 2 and 3 number of standard drinks was replaced by number of hours "stoned". For item 8, instead of asking about frequency of being "unable to remember what happened the night before because you had been drinking", participants were asked for the frequency of "problems with your memory or concentration after using cannabis" (Adamson & Sellman).

A further change from the AUDIT was that participants were asked to relate the questions to the past 6 months in order to coincide with the 6-month duration of other baseline and follow-up measurements (Adamson & Sellman, 2003). The AUDIT items apply to the current time (items 1 to 3), the past year (items 4 to 8), or provide response options for past year or prior to the past year (items 9 and 10). The classification of scores also differs from the AUDIT, which recognises three domains (e.g., hazardous alcohol use, dependence symptoms, and harmful alcohol use).

The ability of the CUDIT to accurately screen for cannabis use and dependence was examined using 53 participants who were originally recruited for a study that aimed to identify the effectiveness of a randomised controlled trial of Motivational Enhancement Therapy (MET) for people diagnosed with mild to moderate alcohol dependence (Sellman, Sullivan, Dore, Adamson, & MacEwan, 2001). Sellman et al's results found that in patients with mild to moderate alcohol dependence, MET is more effective for reducing unequivocal heavy drinking than either a feedback/education session alone or four sessions of nondirected reflective listening. This population was used to develop the CUDIT as they reported smoking cannabis in the past six months (in addition to having a primary diagnosis of alcohol dependence). Additionally, for these 53 participants a current mood disorder was identified in 6% of subjects while for anxiety disorders the current rate was 17%. A current diagnosis of either conduct disorder or antisocial personality disorder was identified in 15% of the sample. Within a clinical treatment population the CUDIT demonstrates adequate reliability, with a reported Cronbach's Alpha of 0.84 (Adamson & Sellman, 2003). The CUDIT is also able to reliably identify individuals with cannabis use disorders, with acceptable specificity (95%) and sensitivity (73%) at a cut-off of 8 (Adamson & Sellman). However, it is not clear if the

CUDIT achieves the same reliability in a community-based population, as specific studies examining the CUDIT's performance have mostly been conducted on clinical populations.

The CUDIT's performance has been examined in clinical populations in New Zealand (Adamson & Sellman, 2003). Adamson and Sellman's research focused on the ability of the CUDIT to accurately screen for cannabis abuse or dependence, which was examined in a New Zealand clinical sample that reported some cannabis use over the preceding 6 months (n = 53). The CUDIT was superior to the frequency measure, achieving positive predictive power of 85% and sensitivity of 73% at a cut-off of 8. Adamson and Sellman concluded that these results indicate the practicality of a screening measure for identifying cannabis use disorder in at risk clinical populations.

The CUDIT's performance has also been examined with a clinical population in a Swiss population survey (Annaheim, Rehm, & Gmel, 2008). According to Annaheim et al's results obtained from their Swiss population, Item 9 (injuries) and Item 2 (usual hours being stoned) on the CUDIT, which were derived from the AUDIT did not perform well. These results were consistent with those obtained from a French clinical sample (Guillem et al., submitted). Specifically, these items were rarely endorsed by cannabis users, showed low scale correlations, and did not increase Cronbach's α when included. Therefore, these items proved unsuitable for the detection of problematic cannabis use. Accordingly, Annaheim, Scotto, and Gmel (2010) completed a study aimed at improving the psychometric properties of the CUDIT, achieved by replacing these items (Item 2 and 9) that performed poorly, with new items that specifically addressed cannabis use.

Annahiem et al (2010) collected CUDIT data from the 2007 Swiss Cannabis Monitoring Study, which included a sub-sample of 558 (total n= 5722) aged 13 to 32. The general population sample consisted of 12% daily or almost daily users; 29% used cannabis on a

weekly basis (e.g., one to five times per week), 34% on a monthly basis, and 25% had used cannabis at least once during the last six months, but not on a monthly basis (Annaheim et al.). Four new items were added to the original CUDIT. Psychometric properties of all 14 items, as well as the dimensionality of the supplemented CUDIT were then examined using Item Response Theory. Results indicated the unidimensionality of CUDIT and an improvement in its psychometric performance when three original items (usual hours being stoned, injuries, and guilt) were replaced with new items (motives for using cannabis, missing out on leisure time activities, and difficulties at work/school). However, improvements were limited to cannabis users with a high problem score. For epidemiological purposes, any further revision of CUDIT should therefore include a greater number of 'easier' items. Compared to the original version, the revised CUDIT has slightly improved model fit when measured by CFI (0.94 versus 0.93), and internal consistency (Cronbach's Alpha) also increased (from 0.76 to 0.80).

In response to the concerns raised by Annahiem et al. (2008; 2010), regarding the psychometric properties and item appropriateness of the CUDIT, Adamson, Kay-Lambkin, Baker, Lewin, Thornton, Kelly, and Sellman (2010) revised the CUDIT. A revised CUDIT-R was developed, which contains eight items, comprising of four original CUDIT items and four new items (see Table 5). The sample recruited for the development of the CUDIT-R consisted of 144 patients who were originally taking part in a clinical trial of Cognitive Behavioural Therapy for depression and substance misuse and recruited from the self-help for alcohol, drug use, and depression (SHADE) study (Kay-Lambkin, Baker, Lewin, & Kelly, 2008). All participants met the criteria for current depressive symptoms, scored 17 or greater on the Beck Depression Inventory II (BDI-II; Beck, 1993), and had concurrent hazardous use of alcohol, cannabis and/or amphetamines (Adamson et al., 2010). Participants were

administered the trial CUDIT-R at intake, 6 months, and 12 months. At each time point formal diagnoses of cannabis abuse or dependence were made using the Structured Clinical Interview for DSM Disorders (SCID).

Receiver Operator Characteristic (ROC) analysis was used in order to determine, which cut-off score allowed for the best trade-off between sensitivity and specificity, when calibrated against the presence or absence of a DSM-IV diagnosis of cannabis use problems. Following this statistical procedure, a cut-off score of 13 was proposed as indicating possible cannabis use disorder and a score of 8 indicating hazardous cannabis use, producing high sensitivity (91%) and specificity (90%). According, to Adamson et al. the 8 item CUDIT-R has improved performance over the original scale and appears well suited to the task of screening for problematic cannabis use within a clinical population.

Table 5

The Items of the CUDIT and the CUDIT-R

The CUDIT (Adamson & Sellman, 2003)	The CUDIT-R (Adamson et al., 2010)
How often do you use cannabis?	How often do you use cannabis?
How many hours were you "stoned" on a typical day when you had been using cannabis?	How many hours were you "stoned" on a typical day when you had been using cannabis?
How often were you "stoned" for 6 or more hours?	*Deleted in the CUDIT-R*
How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?	How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?
How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?	How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?
How often during the past 6 months did you needed to use cannabis in the morning to get yourself going after a heavy session of using cannabis?	How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis?
How often during the past 6 months did you have a feeling of guilt or remorse after using cannabis?	*Deleted in the CUDIT-R*
How often in the past 6 months have you had a problem with your memory or concentration after using cannabis?	How often in the past 6 months have you had a problem with your memory or concentration after using cannabis?
Have you or someone else been injured as a result of your use of cannabis over the past 6 months?	How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children?
Has a relative, friend or a doctor or other health worker been concerned about your use of cannabis or suggested you cut down over the past 6 months?	Have you ever thought about cutting down, or stopping, your use of cannabis?

Bruno, Gomez, de Graaff, Matthews, and Adamson, (2009) conducted a study that aimed to examine the psychometric properties of the 8-item CUDIT-R, and to assess its convergent and concurrent validity. According to the results of the study the CUDIT-R demonstrates

good psychometric properties within their sample of very high frequency 'hard' substance consumers , the CUDIT-R is unidimensional, and is able to differentiate between cannabis users who experience few problems and those who experience notable problems with their use (Bruno et al.). The scale has also demonstrated acceptable levels of test-retest reliability (Bruno et al.). Accordingly, Bruno et al. concluded that the CUDIT-R is a useful clinical tool for identifying problematic cannabis use.

However, according to Adamson et al. (2010) the findings of the CUDIT-R validation study are limited by the nature of the sample, in that it was a treatment population, with all patients having a mood disorder at entry into the study, as well as high rates of alcohol and amphetamine use. However, the nature of the treatment population used in the validation of the CUDIT-R is not unlike other cannabis use populations, where poly-drug use and mood disorder are high (Adamson et al., 2006; Weaver et al., 2003). Adamson et al. identify that the CUDIT-R may not be representative of a community population and acknowledges that the existing CUDIT-R psychometrics have only been obtained from a clinical treatment population. Therefore, while the proposed thresholds correctly identify problematic cannabis use within a clinical population it is unclear if a community population endorses the items in the same way. Accordingly, it is recommended that community data be collected for the CUDIT-R to identify the severity cut-off scores within this population (Adamson et al., 2008) as it is necessary to norm the CUDIT-R on a community population in order to be confident in interpreting the results of the CUDIT-R obtained from this population.

The CUDIT-R cut-off scores are designed to identify cannabis dependence on the DSM-IV criteria of substance use dependence. Accordingly, while the CUDIT-R is helpful in identifying individuals with problematic cannabis use problems, the screening instrument fails to account for people who are at risk or who experience mild problems with cannabis

use. In order to make the CUDIT-R more consistent with the proposed DSM-5 classification system it is beneficial to develop cut-off scores that are mirrored on the DSM-5 severity of use thresholds, specifically, Mild Cannabis Use Disorder (2 to 3 criteria), Moderate Cannabis Use Disorder (4 to 5 criteria), and Severe Cannabis Use Disorder (6 or more criteria). This is likely to be beneficial, as it would enable the CUDIT-R to correctly identify sub-threshold cannabis related problems, and consequently be consistent with the proposed classification system.

Clinically Interpreting CUDIT-R Scores

Screening instruments are beneficial as they can provide an indication of the presence of a possible diagnosis, which requires further investigation. However, they do not provide information about the unique features of an individual's problem (Dawe et al., 2002) and while higher consumption levels generally predict greater problem severity, even irregular users can experience substantial psychosocial impairment (Bashford, 2007). It is necessary and important for screening instruments to provide some indication of possible psychosocial functioning at identified cut-off scores to better inform clinical intervention and an indication of potential problems with continued use.

Specifically, it would be beneficial and helpful for screening instruments to include an indication of the potential risk and likelihood of cannabis use on psychological distress, psychological wellbeing, and physical and mental health. Furthermore, it would be useful if screening instruments such as the CUDIT-R provided a percentage of individuals who experience deficits in these areas at varying levels of cannabis use severity. Accordingly, it is essential to supplement a cannabis-screening instrument with additional information about psychosocial factors that may exacerbate or affect the severity of use, or be useful in implementing management strategies and interventions (Dawe et al., 2002).

This is a particular limitation identified with the CUDIT-R. Specifically, the CUDIT-R does not provide a clinical interpretation of the scores obtained in terms of the possible and likely psychosocial difficulties. Accordingly, it is likely that many healthcare professionals who use the CUDIT-R within a community population are unsure as to how to interpret CUDIT-R score beyond the proposed labels of "hazardous cannabis use" and "possible cannabis use disorder". Healthcare professionals using the CUDIT-R would benefit from an indication of possible psychosocial difficulties experienced at varying levels of cannabis use severity and inform the implementation of possible interventions, which may prevent escalation of further problems (Degenhardt et al., 2002).

Moreover, assessment of the specific types of adverse health and psychosocial consequences, their number, frequency, and severity is crucial for understanding the nature and extent of impact on the individuals' life, and planning appropriately targeted intervention strategies (APA, 2000; Bashford 2007).

Accordingly, it is not only essential that the CUDIT-R is mirrored against the DSM-5 Cannabis Use Disorders criteria to identify severity and frequency of use and dependence, but that these thresholds would also benefit from an indication of potential psychosocial difficulties associated with severity of cannabis use and dependence. Providing an indication of typical psychosocial functioning at CUDIT-R cut-off points may also inform the delivery of appropriate interventions prior to the onset of substance use disorder, enable clinical interventions to be implemented at early stages of risk to prevent future risk, provide important information about possible interventions and services to reduce harm of use, and provide interventions to promote positive psychological and psychosocial functioning (Thake & Davis, 2011).

The CUDIT was developed as a brief cannabis screen, which has recently been revised and published as a psychometrically reliable cannabis-screening instrument. However, as with all new instruments, the CUDIT-R has several shortcomings. Accordingly, the current research aims to elevate the limitations associated with the CUDIT-R to improve its population application and usefulness, clinical interpretation, and preliminary diagnostic reliability. To achieve this, the current research aims to:

1. Test the validity of the cut-off point for DSM-IV cannabis dependence within a community sample.
2. Determine cut-off scores (mild dependence, moderate dependence, and severe dependence) on the CUDIT-R, which are consistent with the DSM-5 interpretation of cannabis use disorders within a community sample.
3. Provide an indication of possible psychosocial difficulties experienced at varying CUDIT-R thresholds, which may better inform healthcare professions of possible associated difficulties and indicate possible areas for intervention.

Chapter 2: Method

Participants

Three hundred and ten participants who met the research criteria consented to participate in the study. Inclusion criteria included: being an Australian resident, being over the age of 18, and having smoked cannabis in the past 6 months. Participants were recruited through several mediums. Firstly, the research was advertised using posters (see Appendix B1). Two versions were circulated in popular community areas such as the University of Tasmania, in local clubs and pubs, in public toilets, and in cafes in Tasmanian towns including Hobart, Launceston, Devonport, Burnie, George Town, and Beaconsfield. This

allowed for a comprehensive community sample. The posters were circulated once a week for 22 weeks to ensure maximum exposure of the research. The second method of recruiting participants, which was initiated alongside the poster advertising, was through online cannabis user forums. To achieve this, the researcher created an account with Australian based cannabis user forums, including the Marijuana Forum (www.themarijuanaforum.com) and Australia's Cannabis Culture Forum (http://ozstoners.com/index.php) and advertised the research on the forum research wall. The forums were frequented each week. The blurb used to advertise the research on this forum is included in Appendix B2.

The research was also advertised using online social networks, including Facebook and Twitter. The blurb used to advertise on Facebook was the same as that used on the online forum (see Appendix B2). Recruitment on Twitter involved sending the research information to specific cannabis 'clubs', such as '@cannabisstrains' who then shared the research with their 'followers'. The research was circulated on Facebook and Twitter weekly. Letters were sent to every university psychology faculty across Australia. These letters were addressed to the Head of School requesting support to advertise the research within their faculty (see Appendix B3 for a copy of the letter). The research was also advertised in the Alcohol, Tobacco, and other Drugs Council Tasmania Inc. (ATDC) electronic newsletter (May 2012; see Appendix B4). This newsletter is circulated amongst all ATDC subscribers. Press media was also used to advertise the research. Specifically, an advertisement was placed in the July edition of Warp magazine advertising the research. The press media was printed as an A6 size ad in the magazine (see Appendix B5) and ran for one edition of the magazine.

Materials

An online questionnaire package (see Appendix C1) was activated and hosted by LimeSurvey Version 1.92+. Several measures were used to create the online questionnaire

package, which included measures of cannabis use, cannabis outcomes, cannabis expectancies, outcome measures, and drug use. Questions related to cannabis use focused on the frequency, quantity, administration, and cost of cannabis use.

Cannabis outcome measures.

The CUDIT-R

The CUDIT-R (Adamson & Sellman, 2003, see Appendix C2) is an eight-item self-report cannabis misuse-screening instrument employing a 5-point Likert Scale. The CUDIT-R exhibits improved psychometric properties (Adamson, 2010) over the original scale (CUDIT, 2003) and appears well suited to the task of screening for problematic cannabis use within a clinical population. The maximum possible score is 40, with a cut-off score of 8 indicating 'hazardous' cannabis use, and a cut-off score of 12 or more indicating "possible cannabis use disorder" for which further intervention may be required (Adamson, 2009). These CUDIT-R questions have been validated for their ability to produce DSM-IV diagnoses in the context of clinical samples and it is highly likely that the CUDIT-R would be appropriate in epidemiological work based on the AUDITs appropriateness in epidemiological work (Barbor, Higgins-Biddle, Saunders & Monteiro, 2001). The CUDIT-R items were used to create DSM-IV and DSM-5 clinical cut-off scores that mirror the DSM-5 and DSM-IV diagnosis of cannabis use disorder and cannabis dependence respectively.

The DSM-IV and DSM-5.

The DSM-IV and DSM-5 (APA) criteria for cannabis dependence (DSM-IV) and substance use disorder (DSM-5) were included in the questionnaire, based on items used in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC, see Chen et al., 2006 for further information on the NESARC methodology and findings) and in the

Composite International Diagnostic Interview - Substance Abuse Module (CIDI-SAM). The NESARC included a series of questions that were adapted and modified from the Alcohol Use Disorder and Associated Disability Interview Schedule-IV (AUDADIS-IV). The questions in the NESARC are relevant to the assessment of the new DSM-V diagnosis of substance use disorder and were therefore deemed appropriate to be included as DSM-IV and DSM-5 criteria in the current survey. A total of 34 questions were included. Accordingly, the community based cut-off scores were mirrored against DSM-5 criteria to provide an accurate representation of an individual's potential risk.

The severity of dependency scale.

The SDS (Gossop et al., 1995, see Appendix C4) provides a brief measure of the psychological aspects of dependence experienced by users of various types of illicit drugs, such as control over cannabis use, anxiety about use, and difficulty stopping (Gossop et al.). In the current study the SDS was used to establish an individual's severity of cannabis dependence and as a means of concurrent validation. The severity of dependence is established by rating each answer on a scale of 0 to 3. The range of possible scores on this questionnaire is between 0 and 15 indicating minimum to maximum severity of cannabis dependence respectively (Gossop et al.). The SDS has cut-off scores for adults (SDS = 3) and adolescents (SDS = 4) (Gossop et al.). The SDS cut-off of 3 was used in the current research to make predictions of cannabis dependency.

Psychosocial outcome measures.

The kessler psychological distress scale.

The Kessler Psychological Distress Scale (K-10, Kessler et al, 2002, see Appendix C6) is a 10-item questionnaire intended to yield a global measure of psychological distress

based on questions about symptoms of anxiety and depression that an individual has experienced in the most recent 4-week period. The K-10 measures clinical distress and is important to include as it can indicate how cannabis use may predict levels of psychological distress, and accordingly relates directly to clinical outcome of cannabis use. Scores range from 10 to 50. People who score under 20 are likely to be well (i.e., have no mental disorder), score 20 to 24 are likely to have a mild mental disorder, score 25 to 29 are likely to have moderate mental disorder, and score 30 and over are likely to have a severe mental disorder (Andrews & Slade, 2001). Thirteen percent of the adult population will score 20 and over and about 1 in 4 people who are seen in primary health care will score 20 and over (Andrews & Slade).

Short form-12 health survey.

Short Form-12 Health Survey (SF-12, Ware, Kosinski, & Keller, 1996, see Appendix C7) includes 12 questions taken from the original SF-36 Health Survey. The SF-12 includes 8 concepts commonly represented in health surveys: physical functioning, role functioning physical, bodily pain, general health, vitality, social functioning, role functioning emotional, and mental health. Results are expressed in terms of two meta-scores: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). The SF-12 is scored so that a high score indicates better physical functioning. Scores from normative samples, range from 0 to 100 (M= 50; SD= 10), where a score of zero score indicates the lowest level of health measured by the scales and 100 indicates the highest level of health (Ware et al.). In the current study cut-off scores were identified for the PCS at one SD above and below the normative sample M and for the MCS at one SD above and below the M (Ware et al.).

The psychological wellbeing inventory.

The Psychological Wellbeing Inventory (PWI, Cummins, 2006, see Appendix C9) is a 12-item scale, which consists of 6 dimensions, including autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. The self-report scale assesses an individual's wellbeing at a particular time within each of these six dimensions. Higher scores on each scale indicate greater wellbeing on that dimension. Scores range from 0 (extremely dissatisfied) to 100 (extremely satisfied). The normative *M* range for Australia is 73 to 76 points (Cummins & Lau, 2010). In the current study cut-off scores were identified against one and two *SD* below and above the normative sample.

Procedure

The Tasmanian Human Research Ethics Committee Tasmania Network approved a full ethics application for this research (Appendix D1). A pilot study was conducted using postgraduate students and research staff at the University of Tasmania, which improved the quality and efficiency of the survey as several items were removed due to being repetitive or irrelevant and several new items were added, which were identified as more relevant to the current study. The pilot study as ensured that scales within the survey was presented in a logical progression. The survey was then activated online and advertising commenced for the recruitment of participants. From the advertisement, participants were instructed to navigate their way to the online survey using the URL/web address provided and asked to complete the online survey. The survey was timed in the pilot study to take approximately 40 minutes to complete. Participants were asked to complete all questions, but were given the option of skipping questions that they did not want to respond to. The online survey was the only task

required of participants. Accordingly, once participants had completed the survey their participation in the study was concluded.

In appreciation of participant's time, those who completed the survey were then invited to be included in an anonymous prize draw to win one of three $500 JB Hi-Fi electronic gift vouchers. The prize invitation (Appendix D4) form was hosted on a separate website to the research survey. In this way, submitted entries were not connectable with individual surveys. A dump of the data was reviewed in August and used in the final analysis. Once the survey was deactivated the prize draw was drawn and the JB Hi-Fi electronic gift vouchers were sent directly to the prize-winner's anonymous email address.

ROC analysis

ROC analysis (Coombs, Dawes, & Tversky, 1970) was used to determine optimal cut-off points for the CUDIT-R that would distinguish cannabis dependent cases from non-dependent cases as validated against the 'gold standard' diagnostic systems, namely, the DSM-IV and the DSM-V and on the SDS. ROC analysis was employed as it represents an integration of accuracies across a range of possible cut-off scores, or more specifically, across different levels of sensitivity (i.e., the screening instrument correctly identifies subjects with a current diagnosis) and specificity (i.e., it correctly identified those who do not meet diagnostic criteria) (Rey, Morris-Yates, & Staainslaw, 1992; Rice & Harris, 1995; Swets, 1992). For this study, Youden's Index was used to calculate a cut-off score that can be used to identify a cut-off score for the DSM-IV, DSM-5 (mild), DSM-5 (moderate), DSM-5 (severe), and the SDS (outcome measure). Youden's Index is a single statistic that captures the performance of a diagnostic test (Youden, 1950).

A ROC curve is obtained by plotting sensitivity against the false positive rate for all possible cut-off points of the instrument (Rey et al., 1992). A crucial competent of ROC is

the area under the curve (AUC). According to Hsu (2002, p. 414), the AUC "reflects the probability that a randomly selected person from one population will have a scale score that exceeds that of a randomly selected person from another population". The performance of an instrument is determined by the magnitude of the AUC, specifically, the higher the AUC, the better the instrument is at distinguishing between cases (Brown & Davis, 2006). For example, an AUC of 1 is considered to be a perfect test, 0.80 to 0.90 is considered to be a good discriminator, and 0.5 and below represents a relatively inefficient measure (e.g., the measure does not perform better than chance) (Swets, 1996).

ROC also calculates the Positive Predictive Value (PPV) and the Negative Predictive Value (NPV) of the cut-offs. The PPV of a cut-off refers to the proportion of individuals classified as cases that have received the diagnosis, while the NPV refers to the proportion of individuals classified as non-cases who do not receive a diagnosis (Haney, Comer, Ward, Foltin, & Fischman, 1999). Positive and Negative Likelihood Ratios (LR+, LR-) are also produced, which are based on sensitivity and specificity and are used to assess diagnostic tests and calculate post-screening probabilities (Brown & Davis, 2006). Positive likelihood ratios (LR+) are calculated by sensitivity divided by 1 − specificity, whereas negative likelihood ratios (LR-) are calculated by 1 − sensitivity divided by specificity.

Chapter 3: Results

The sample consisted of 310 participants ranging in age from 18 years to 64 years (M= 27.3 years, SD= 10.3 years) of which 57% were male, 38% were female, 1% were transgender, and 4% did not report their gender. 27%of participants reported their highest level of education obtained was year 10 or below, 38% reported this as year 11 to 12; and 34% reported their highest level of education obtained was university, of which 24% had

obtained a Bachelor degree and 10% had achieved higher than a Bachelor degree. In relation to occupational status, 43% reported being students and 37% reported that they were in paid employment, and 20% reported being unemployed or other (e.g., volunteer work). The mean age for the first time cannabis use was 17 years (range 8 to 52 years). Table 6a reports the base rate of DSM symptoms. Specifically, the results show that 71% reported that their cannabis use had caused problems with their family or friends, 32% reported that their cannabis use often lead to them being in unsafe situations, and 12% reported that their cannabis use had led them to cutting down on activities they once enjoyed, such as school or work.

Table 6a

Base rate of DSM Symptoms

DSM Symptom	Percentage of Sample Reporting
In the past 6 months did you take more cannabis or a similar drug to get over or avoid any of these bad aftereffects?	87% no 13% yes
In the last 6 months, did you have any of the following bad aftereffects when the effects of cannabis were wearing off? This includes the morning after using it or in the first few days of stopping or cutting	79% no 21% yes
In the past 6 months have you had job or school troubles as a result of your cannabis use? (e.g., missing too much work, not doing your work well, being demoted, or being suspended, or dropping out of school).	91% no 9% yes
In the past 6 months have a period when your cannabis use (or recovering from your cannabis use) often interfered with taking care of your home or family?	91% no 9% yes
In the past 6 months have you accidently injure yourself while under the influence of cannabis? (e.g., have a bad fall, cut yourself badly, hurt in a traffic accident where you were driving)	91% no 9% yes

During the past 6 months have you more than once drive a car, motorcycle, truck, boat, or other vehicle when you were under the influence of cannabis?	68% no 32% yes
During the past 6 months have you found yourself under the influence of cannabis or feeling its after-effects in situations that increased your chances of getting hurt? (e.g., swimming, using machinery, or walking in a dangerous area or around heavy traffic)	81% no 19% yes

DSM Symptom	Percentage of Sample Reporting
During the past 6 months have you had arguments with your spouse, boyfriend/girlfriend, family, or friends as a result of your cannabis use?	83% no 17% yes
During the past 6 months have you gotten into physical fights while under the influence of cannabis?	99% no 1% yes
During the past 6 months have you continue to use cannabis even though you knew it was causing you troubles with your family or friends?	29% no 71% yes
During the past 6 months have you tried more than once to stop or cut down using cannabis but found you couldn't do it	62% no 38% yes
During the past 6 months have you often use cannabis in larger amounts or for a much longer period than you meant to?	72% no 28% yes
During the past 6 months have you had a period of a month or more when you spent a lot of time using cannabis or getting over its bad after-effects?	80% no 20% yes
During the past 6 months have you found that your usual amount of cannabis had much less effect on you than it once did?	65% no 35% yes
During the past 6 months have you given up or cut down on activities that were important to you in order to use cannabis like work, school, or associating with friends or	88% no 12% yes

relatives?

Note: The DSM symptom questions were mirrored in the DSM criteria questions NESARC, which included a series of questions that were adapted and modified from the AUDADIS-IV to create diagnostic categories.

Of the 310 participants 54% of participants did not meet the criteria for Cannabis Use Disorder (DSM-5 no diagnosis), 22% met the criteria for mild Cannabis Use Disorder, 10% met the criteria for moderate Cannabis Use Disorder, and 14% met the criteria for severe Cannabis Use Disorder (see Table 6b). Additionally, according to the DSM-IV criteria 61% of participants did not met the criteria for cannabis dependency or abuse, 13% of participants met the criteria for cannabis abuse, and 26% met the criteria for cannabis dependency.

Table 6b

Prevalence of DSM-IV and DSM-5 Diagnosis

DSM Diagnosis	Percentage of Sample Reporting
DSM-IV Cannabis Abuse	30%
DSM-IV Cannabis Dependence	26%
DSM-5 Mild Cannabis Use disorder	22%
DSM-5 Moderate Cannabis Use Disorder	10%
DSM-5 Severe Cannabis Use Disorder	14%

In terms of frequency of cannabis use 46% of participants reported using cannabis on a weekly basis (see Table 6c). Specifically, 10% of participants reported using cannabis once to twice a week and 36% of participants reported using cannabis three to four times a week on average. On a typical day when smoking cannabis, 79% of participants reported that on average they would smoke between 1 to 9 cones (e.g., smoking cannabis through any pipe instrument), bongs (e.g., strictly smoking cannabis through a water pipe), or joints and 21% reported smoking 10 or more cones, bongs, or joints. The most common method of smoking cannabis was in a joint (48%), followed by cones (23%), and bongs (18%).

Table 6c

Base Rate of CUDIT-R Scale Items

CUDIT-R Scale Item	Percentage of Sample Reporting
How often do you use cannabis?	31% monthly or less 22% 2 - 4 times a month 10% 2-3 times a week 36% 4 or more times a week
How many hours were you "stoned" on a Typical day when you had been using cannabis?	8% < 1 hour 29% 1 – 2 hours 36% 3 – 4 hours 15% 5 – 6 hours 12% > 7 hours
How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?	71% never 9% < monthly 4% monthly 3% weekly 13% daily or almost daily
How often during the past 6 months did you fail to do what was expected of you because of using cannabis?	63% never 22% < monthly 7% monthly 5% weekly 3% daily or almost daily
How often during the past 6 months have you devoted a great deal of time to getting, using, or recovering from cannabis?	56% never 19% < monthly 9% monthly 9% weekly 8% daily or almost daily
How often during the past 6 months have you had problems with your memory or concentration after using cannabis?	41% never 28% < monthly 12% monthly 9% weekly 9% daily or almost daily
How often during the past 6 months do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children?	65% never 16% < monthly 6% monthly 4% weekly 9% daily or almost daily
Have you ever thought about cutting down or stopping your cannabis use?	37% no 22% yes 42% unsure

Cannabis withdrawal was reported by 26% of participants, who reported the experiences of psychological, emotional, and physical symptoms two or more days after cannabis abstinence. Twenty-one percent of participants reported experiencing strong cravings for more cannabis once the initial effects had started to wear off. Tolerance was reported by 35% of participants and 38% reported that they have been unsuccessful in cutting down on their cannabis use despite wanting to. There was a significant relationship between the CUDIT-R and accessing services for cannabis use, $r = -.33$, $p < .001$.

Table 7 shows the percent of other drugs (including, tobacco, alcohol, tranquilisers, hallucinogens/LSD/magic mushrooms, amphetamines, heroin, methadone, opioids, cocaine, and ecstasy) used by participants during the past six months. The most commonly used other drug was alcohol (91% reported use over the past six months) and followed by tobacco (56%). The most commonly use illicit drug was hallucinogens/LSD/magic mushrooms, with 24% reporting use in the past six months.

Table 7

Percentage of other Drugs Used in the Past Six Months

Substance	Daily or almost daily	Once a week or more	Once a month	Less than once a month	In the past six months
Tobacco	26% (daily)	10%	13% (less than weekly)	na	56%
Alcohol	13%	36%	31%	20%	91%
Tranquilisers	3%	13%	15%	69%	14%
Hallucinogens	na	2%	25%	73%	24%
Meth/amphetamines	2%	6%	26%	66%	47%
Heroin	na	100%	na	na	1%
Methadone	na	10%	na	90%	4%
Opioids	na	25%	19%	56%	6%
Cocaine	na	na	5%	95%	7%
Ecstasy	na	6%	19%	75%	19%

There was a significant correlation between frequency of cannabis use and age, r=.33, p <.001. Table 8 shows the correlations between the CUDIT-R and the total scores on the cannabis outcome measures and the psychosocial measures. Specifically, the CUDIT-R was significantly correlated with the amount of cannabis used, r= .50, p<.001, the frequency of cannabis use (amount of days), r= .66, p<.001, and how many hours were spent stoned (per day), r= .59, p<.001. There was a significant relationship between the CUDIT-R and the DSM-5 cannabis use disorder symptoms, r= .74, p<.001, the DSM-IV diagnosis of dependence categories, r= .57, p<.001, the SDS r= .76, p<.001, and the K-10 r= .29, p<.001. There was a significant negative correlation between the CUDIT-R and SF-12, PCS r= -.22,

$p<.001$ and MCS $r= -.26$, $p<.001$ and a significant negative relationship between the CUDIT-R and the PWI $r= -.34$, $p<.001$.

Table 8

Correlations between the CUDIT-R and Outcome Measures

Scale *	*n*	Correlation (*r*)	Significance (*p*)
Amount of cannabis used daily	299	0.50	0.001
Frequency of cannabis use (monthly – weekly)*	310	0.66	0.001
Hours spent stoned on a typical day where cannabis is used	310	0.59	0.001
DSM-5 (total item sum)	310	0.74	0.001
DSM-IV (total item sum)	310	0.65	0.001
SDS (total item sum)	278	0.76	0.001
K-10 (total score)	274	0.29	0.001
PWI (total score)	269	-0.34	0.001
SF-12 (physical component) (total score)	266	-0.22	0.001
SF-12 (mental component) (total score)	266	-0.26	0.001

* Participants indicated their frequency of cannabis use as one of the following: never, monthly or less, 2 -4 times a month, 2-3 times a week, or 4 or more times a week.

**SDS- Severity of Dependency Scale; K-10- The Kessler Psychological Distress Scale; PWI – The Psychological Wellbeing Inventory; SF-12 – Short Form-12 Health Survey

***Note: The DSM variables were scored in accordance to the scoring proposed in the DSM-5 manual (e.g., 0 to 1 criteria (no diagnosis); 2 to 3 criteria (Mild Cannabis Use Disorder); 4 to 5 criteria (Moderate Cannabis Use Disorder); and 6 or more criteria (Severe Cannabis Use Disorder) were created the diagnostic categories.

3.1: Results - DSM-IV ROC Analysis (Aim 1)

Figure 1 illustrates the ROC curve for the CUDIT-R/DSM-IV. The AUC was 0.88, illustrating a roughly 88% likelihood that a randomly selected participant who was dependent on cannabis (according to the DSM-IV criteria) would have a higher CUDIT-R score than would a randomly selected participant who was not dependant on cannabis. Furthermore, the AUC value was significant ($p<.001$), and the 95% confidence interval (CI = 0.84 - 0.91) bounds did not include 0.50 suggesting diagnostic accuracy that was better than chance alone.

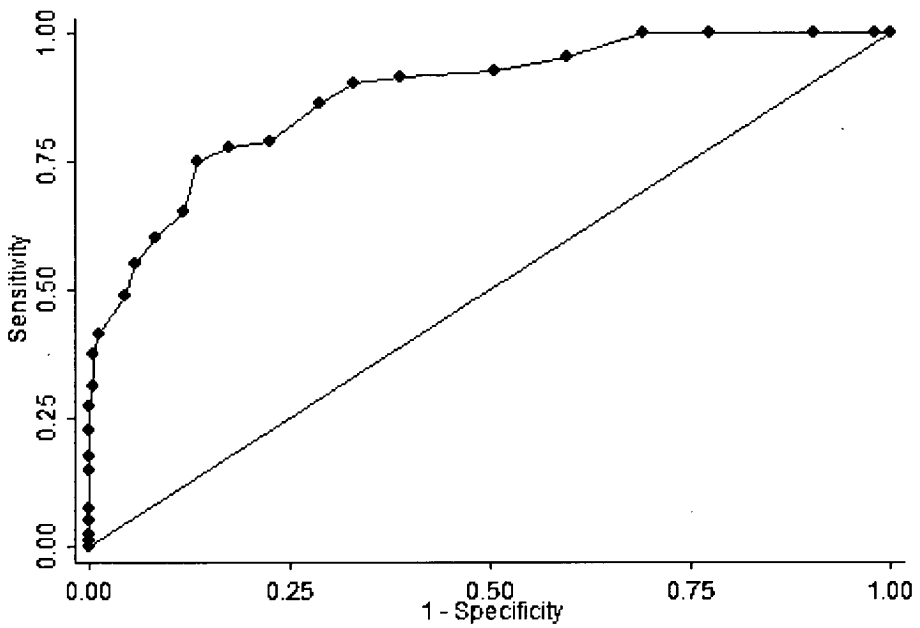

Figure 1. AUC Graph DSM-IV.

The possible sensitivity and specificity scores of the CUDIT-R, ranging from 1 to 28, are shown in Table 9, together with the Positive Likelihood Ratio (LR+) and the Negative Likelihood Ratio (LR-). An optimal solution occurs with CUDIT-R scores of 13 or above (Youden index – 0.62), with 75% of participants with a current cannabis use disorder scoring at or above this level and 87% of participants without a current cannabis use disorder scoring below this level, correctly classifying 84% of participants.

Table 9

Sensitivity, Specificity, Correctly Classified Cases, Likelihood Ratios of Positive and Negative Tests for the CUDIT-R in the Identification of DSM-IV Cannabis Dependence.

CUDIT-R cut-off scores	Sensitivity	Specificity	Correctly classified	LR+	LR-	Youden
1	1.00	0.00	0.26	1.00		0.00
2	1.00	0.02	0.27	1.02	0.00	0.02
3	1.00	0.10	0.33	1.11	0.00	0.10
4	1.00	0.23	0.43	1.29	0.00	0.23
5	1.00	0.31	0.49	1.45	0.00	0.31
6	0.95	0.40	0.55	1.59	0.12	0.35
7	0.93	0.50	0.61	1.83	0.15	0.42
8	0.91	0.61	0.69	2.36	0.14	0.53
9	0.90	0.67	0.73	2.72	0.15	0.57
10	0.86	0.71	0.75	3.01	0.19	0.58
11	0.79	0.77	0.78	3.48	0.27	0.56
12	0.78	0.83	0.81	4.46	0.27	0.60
13*	0.75	0.87	0.84	5.56	0.29	0.62
14	0.65	0.88	0.82	5.54	0.40	0.53
15	0.60	0.92	0.84	7.26	0.44	0.52
16	0.55	0.94	0.84	9.73	0.48	0.49
17	0.49	0.96	0.84	11.21	0.54	0.44
18	0.41	0.99	0.84	31.63	0.60	0.40
19	0.38	1.00	0.84	86.25	0.63	0.37
20	0.31	1.00	0.82	71.87	0.69	0.31
21	0.28	1.00	0.81	0.73		0.28
22	0.23	1.00	0.80	0.78		0.23
23	0.18	1.00	0.79	0.83		0.18
24	0.15	1.00	0.78	0.85		0.15
25	0.08	1.00	0.76	0.93		0.08
26	0.05	1.00	0.75	0.95		0.05
27	0.03	1.00	0.75	0.98		0.02
28	0.01	1.00	0.75	0.99		0.01
28	0.00	1.00	0.74	1.00		0.00

*Optimal combination of sensitivity and specificity, based on Youden Index (sensitivity + specificity-1).

3.2: DSM-5 ROC Analysis (Aim 2)

DSM-5 mild cannabis use disorder (met by the presence of two or more criteria)

Figure 2 provides the ROC curve for the CUDIT-R/DSM-5 (mild). The AUC was 0.83, roughly illustrating 83% likelihood that a randomly selected participant who had mild cannabis use disorder would have a higher CUDIT-R score than would a randomly selected participant who did not have a mild cannabis use disorder. Furthermore, the AUC value was significant ($p<.001$, 95% CI = 0.78 - 0.87) suggesting diagnostic accuracy that was better than chance alone.

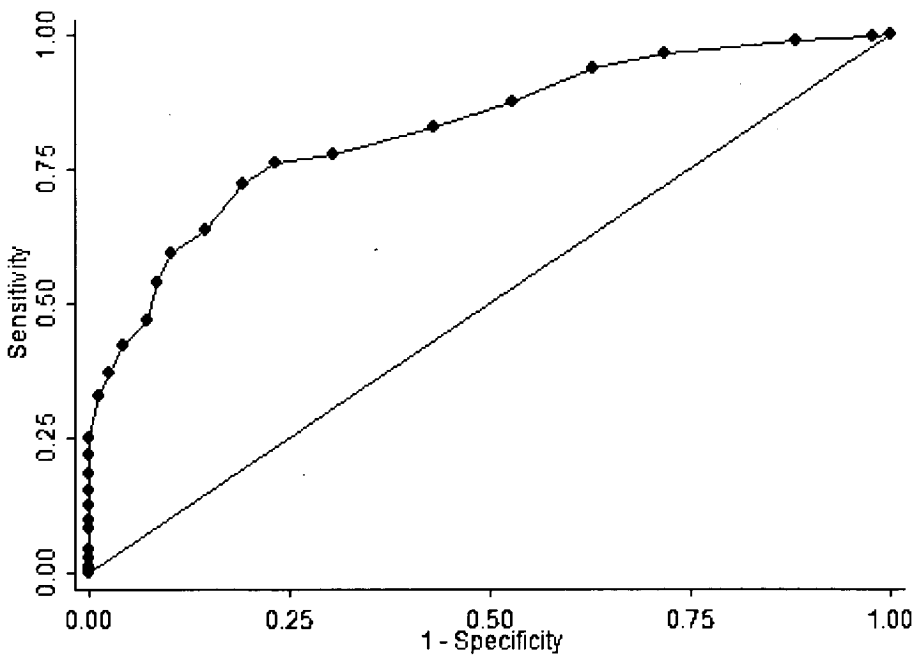

Figure 2. AUC Graph DSM-5 (mild).

As in the prior analysis, sensitivity and specificity data, LR+, LR-, and Youden's Index values were examined to help determine the optimal cut-off scores for the DSM-5 cannabis use dependence categories (see Table 10 - 12). An optimal solution occurs with CUDIT-R scores of 9 or above (Youden index – 0.53), with 76% of participants with a

current cannabis use disorder scoring at or above this level, and 77% of participants without a current cannabis use disorder scoring below this level, correctly classifying 76% of participants.

Table 10

Sensitivity, Specificity, Correctly Classified Cases, Likelihood Ratios of Positive and Negative Tests for the CUDIT-R in the Identification of DSM-5 (mild) Cannabis use Disorder

CUDIT-R cut-off scores	Sensitivity	Specificity	Correctly classified	LR+	LR-	Youden
1	1.00	0.00	0.46	1.00		0.00
2	0.99	0.02	0.47	1.02	0.29	0.02
3	0.99	0.12	0.52	1.12	0.12	0.11
4	0.97	0.28	0.60	1.34	0.12	0.25
5	0.94	0.37	0.63	1.49	0.17	0.31
6	0.87	0.47	0.66	1.66	0.27	0.35
7	0.83	0.57	0.69	1.91	0.31	0.39
8	0.78	0.69	0.73	2.54	0.32	0.47
9*	0.76	0.77	0.76	3.26	0.31	0.53
10	0.72	0.81	0.77	3.76	0.35	0.53
11	0.64	0.86	0.75	4.43	0.42	0.49
12	0.59	0.90	0.76	5.84	0.45	0.49
13	0.54	0.92	0.74	6.42	0.50	0.45
14	0.47	0.93	0.72	6.52	0.57	0.40
15	0.42	0.96	0.71	10.01	0.61	0.38
16	0.37	0.98	0.70	15.47	0.64	0.35
17	0.33	0.99	0.68	27.44	0.68	0.32
18	0.25	1.00	0.65	0.75		0.25
19	0.22	1.00	0.64	0.78		0.22
20	0.18	1.00	0.62	0.82		0.18
21	0.15	1.00	0.61	0.85		0.15
22	0.13	1.00	0.60	0.87		0.13
23	0.10	1.00	0.58	0.90		0.10
24	0.08	1.00	0.58	0.92		0.08
25	0.04	1.00	0.56	0.96		0.04
26	0.03	1.00	0.55	0.97		0.03
27	0.01	1.00	0.55	0.99		0.01
28	0.01	1.00	0.54	0.99		0.01
28	0.00	1.00	0.54	1.00		00.0

*Optimal combination of sensitivity and specificity, based on Youden Index (sensitivity + specificity-1).

DSM-5 moderate cannabis use disorder (met by the presence of four or more criteria)

Figure 3 provides the ROC curve for the CUDIT-R/DSM-5 (moderate). The AUC value for the ROC curve was 0.89, illustrating an approximately 89% likelihood that a randomly selected participant who had moderate cannabis use disorder would have a higher CUDIT-R score than would a randomly selected participant who did not have a moderate cannabis use disorder. Furthermore, the AUC value was significant ($p<.001$, 95% CI = 0.85 - 0.92) suggesting diagnostic accuracy that was better than chance alone.

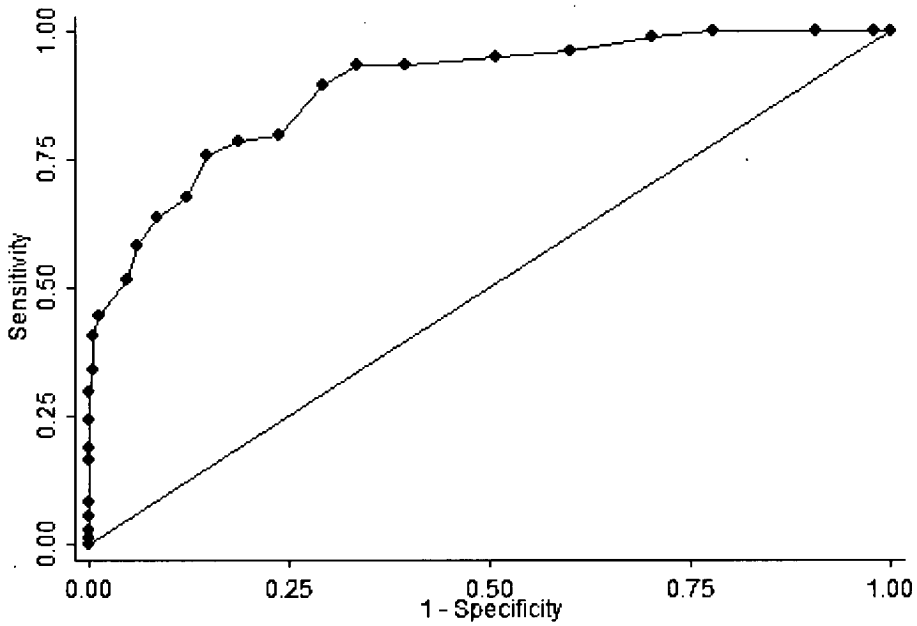

Figure 3. AUC Graph DSM-5 (moderate).

An optimal solution occurs with CUDIT-R scores of 13 or above (Youden index – 0.61), with 76% of participants with a current cannabis use disorder scoring at or above this level and 85% of participants without a current cannabis use disorder scoring below this level, correctly classifying 83% of participants.

Table 11
Sensitivity, Specificity, Correctly Classified Cases, Likelihood Ratios of Positive and Negative Tests for the CUDIT-R in the Identification of DSM-5 (moderate) Cannabis use Disorder

CUTIT-R cut-off scores	Sensitivity	Specificity	Correctly classified	LR+	LR-	Youden
1	1.00	0.00	0.24	1.00		0.00
2	1.00	0.02	0.25	1.02	0.00	0.02
3	1.00	0.09	0.31	1.10	0.00	0.09
4	1.00	0.22	0.41	1.28	0.00	0.22
5	0.99	0.30	0.46	1.40	0.05	0.28
6	0.96	0.40	0.53	1.59	0.10	0.36
7	0.95	0.49	0.60	1.86	0.11	0.44
8	0.93	0.61	0.68	2.37	0.11	0.54
9	0.93	0.67	0.73	2.79	0.10	0.60
10	0.89	0.71	0.75	3.05	0.15	0.60
11	0.80	0.76	0.77	3.36	0.27	0.56
12	0.78	0.81	0.81	4.20	0.27	0.60
13*	0.76	0.85	0.83	5.10	0.29	0.61
14	0.68	0.88	0.83	5.50	0.37	0.55
15	0.64	0.92	0.85	7.49	0.40	0.55
16	0.58	0.94	0.85	9.80	0.45	0.52
17	0.51	0.95	0.85	11.02	0.51	0.47
18	0.45	0.99	0.86	35.08	0.56	0.43
19	0.41	1.00	0.85	95.68	0.60	0.40
20	0.34	1.00	0.84	79.73	0.67	0.33
21	0.30	1.00	0.83	0.70		0.30
22	0.24	1.00	0.82	0.76		0.24
23	0.19	1.00	0.81	0.81		0.19
24	0.16	1.00	0.80	0.84		0.16
25	0.08	1.00	0.78	0.92		0.08
26	0.05	1.00	0.77	0.95		0.05
27	0.03	1.00	0.77	0.97		0.03
28	0.01	1.00	0.76	0.99		0.01
28	0.00	1.00	0.76	1.00		0.00

*Optimal combination of sensitivity and specificity, based on Youden Index (sensitivity + specificity-1).

DSM-5 severe cannabis use disorder (met by the presence of six or more criteria)

Figure 4 provides the ROC curve for the CUDIT-R/DSM-5 (severe). The AUC was 0.90, illustrating 90% likelihood that a randomly selected participant who had severe

cannabis use disorder would have a higher CUDIT-R score than would a randomly selected participant who did not have a moderate cannabis use disorder. Furthermore, the AUC value was significant (p<.001, 95% CI = 0.85 - 0.93) suggesting diagnostic accuracy that was better than chance alone.

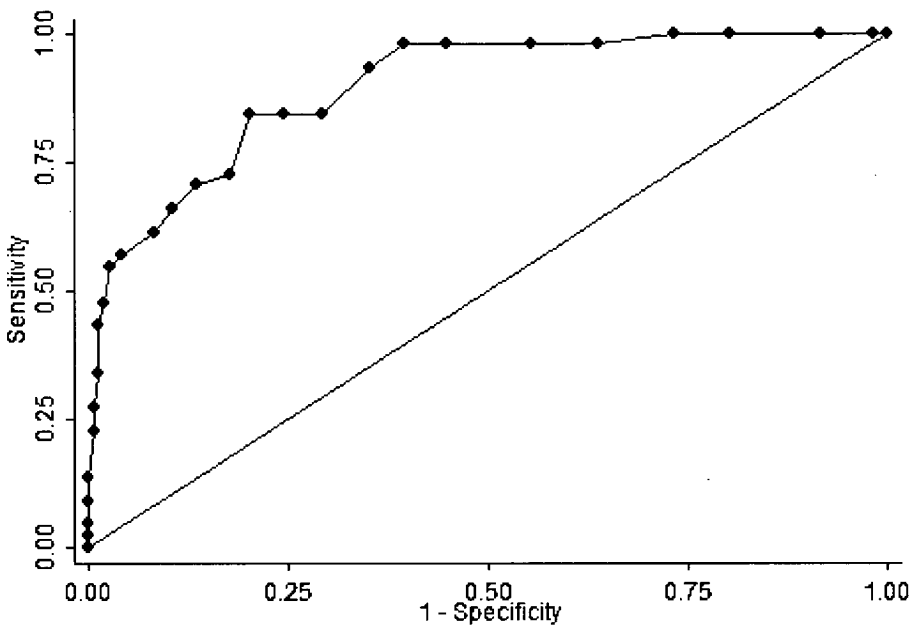

Figure 4. AUC Graph DSM-5 (Severe).

An optimal solution occurs with CUDIT-R scores of 13 or above (Youden index – 64), with 84% of participants with a current cannabis use disorder scoring at or above this level and 80% of participants without a current cannabis use disorder scoring below this level, correctly classifying 80% of participants.

Table 12

Sensitivity, Specificity, Correctly Classified Cases, Likelihood Ratios of Positive and Negative Tests for the CUDIT-R in the Identification of DSM-5 (severe) Cannabis use Disorder

CUTIT-R cut-off scores	Sensitivity	Specificity	Correctly classified	LR+	LR-	Youden
1	1.00	0.00	0.14	1.00		0.00
2	1.00	0.02	0.16	1.02	0.00	0.02
3	1.00	0.08	0.21	1.09	0.00	0.08
4	1.00	0.20	0.31	1.24	0.00	0.20
5	1.00	0.27	0.37	1.36	0.00	0.27
6	0.98	0.36	0.45	1.53	0.06	0.34
7	0.98	0.45	0.52	1.77	0.05	0.42
8	0.98	0.55	0.61	2.18	0.04	0.53
9	0.98	0.61	0.66	2.48	0.04	0.58
10	0.93	0.65	0.69	2.64	0.11	0.58
11	0.84	0.71	0.73	2.87	0.23	0.55
12	0.84	0.76	0.77	3.44	0.21	0.60
13*	0.84	0.80	0.80	4.14	0.20	0.64
14	0.73	0.82	0.81	4.12	0.33	0.55
15	0.70	0.86	0.84	5.21	0.34	0.57
16	0.66	0.89	0.86	6.26	0.38	0.55
17	0.61	0.92	0.87	7.42	0.42	0.53
18	0.57	0.96	0.90	13.74	0.45	0.53
19	0.55	0.97	0.91	20.73	0.47	0.52
20	0.48	0.98	0.91	25.39	0.53	0.46
21	0.43	0.99	0.91	38.29	0.57	0.42
22	0.34	0.99	0.90	30.23	0.67	0.33
23	0.27	0.99	0.89	36.27	0.73	0.27
24	0.23	0.99	0.88	30.23	0.78	0.22
25	0.14	1.00	0.88	0.86		0.14
26	0.09	1.00	0.87	0.91		0.09
27	0.05	1.00	0.86	0.95		0.05
28	0.02	1.00	0.86	0.98		0.02
28	0.00	1.00	0.86	1.00		0.00

*Optimal combination of sensitivity and specificity, based on Youden Index (sensitivity + specificity-1).

Taken together these results identify that the participants involved in this study were low level cannabis users, with the majority identified not receiving a DSM-5 diagnosis of cannabis use disorder. Specifically, based on the CUDIT-R cut-off scores identified, 162/310 (52%) of participants received a CUDIT-R score between 1-8 (no diagnosis), 57/310 (18%)

participants received a diagnosis of mild cannabis use disorder (9-12), and 79/310 (26%) participants receiving a diagnosis of moderate to severe cannabis use disorder.

SDS (cannabis outcome measure)

Figure 5 provides the ROC curve for the CUDIT-R/SDS. The AUC value was 0.89, illustrating an 89% likelihood that a randomly selected participant who had higher levels of cannabis dependence would also score higher on the CUDIT-R than would a randomly selected participant who was not highly dependent on cannabis. The AUC value was significant (p<.001, CI = 0.85 - 0.93) suggesting diagnostic accuracy that was better than chance alone.

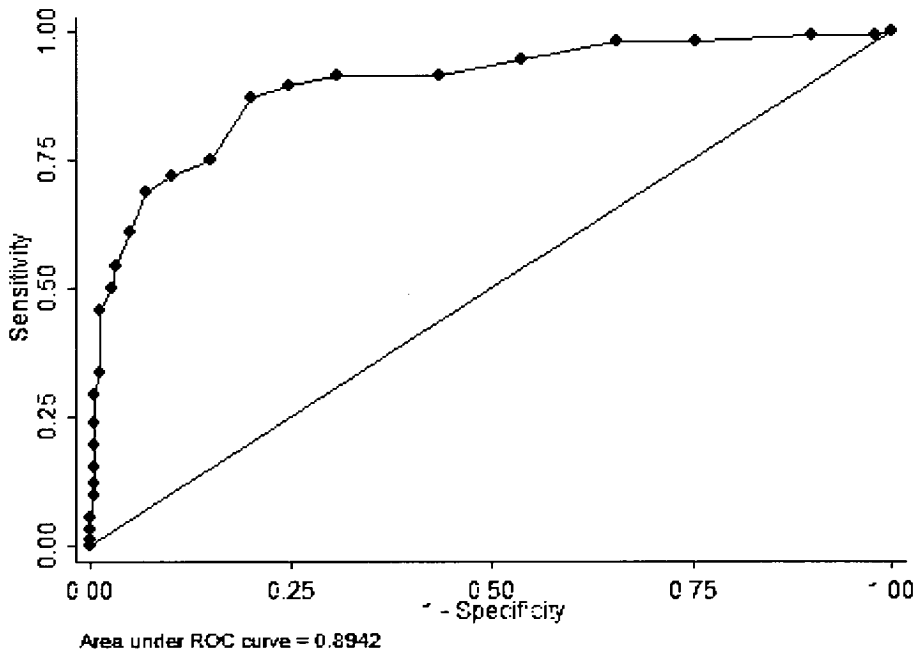

Figure 5. AUC Graph SDS

A cut-off of 3 was identified as a optimal SDS cut-off for adults and the current results found an optimal solution occurs with CUDIT-R at 10 or above (Youden index –

0.67), with 87% of participants with higher levels of cannabis dependence scoring at or above this level and 80% of participants who do not have high levels of cannabis dependence scoring below this level, correctly classifying 82% of participants.

Table 13

Sensitivity, Specificity, Correctly Classified Cases, Likelihood Ratios of Positive and Negative Tests for the CUDIT-R in the Identification of SDS Cut-off Scores

Cut-off scores	Sensitivity	Specificity	Correctly classified	LR+	LR-	Youden
1	1.00	0.00	0.33	1.00		0.00
2	0.99	0.02	0.34	1.01	0.51	0.01
3	0.99	0.10	0.40	1.10	0.11	0.09
4	0.98	0.25	0.49	1.30	0.09	0.23
5	0.98	0.34	0.55	1.49	0.06	0.32
6	0.95	0.46	0.62	1.76	0.12	0.41
7	0.91	0.56	0.68	2.10	0.15	0.48
8	0.91	0.69	0.77	2.98	0.13	0.61
9	0.89	0.75	0.80	3.60	0.14	0.64
10*	0.87	0.80	0.82	4.37	0.16	0.67
11	0.75	0.85	0.82	4.98	0.29	0.60
12	0.72	0.90	0.84	7.02	0.31	0.62
13	0.68	0.93	0.85	9.80	0.34	0.61
14	0.61	0.95	0.84	12.58	0.41	0.56
15	0.54	0.97	0.83	16.85	0.47	0.51
16	0.50	0.97	0.82	18.60	0.51	0.47
17	0.46	0.99	0.81	42.46	0.55	0.45
18	0.34	0.99	0.77	31.34	0.67	0.33
19	0.29	0.99	0.76	54.59	0.71	0.29
20	0.24	0.99	0.74	44.48	0.77	0.23
21	0.20	0.99	0.73	36.39	0.81	0.19
22	0.15	0.99	0.72	28.30	0.85	0.15
23	0.12	0.99	0.71	22.24	0.89	0.11
24	0.10	0.99	0.70	18.20	0.91	0.09
25	0.05	1.00	0.69	0.95		0.05
26	0.03	1.00	0.68	0.97		0.03
27	0.01	1.00	0.67	0.99		0.01
27	0.00	1.00	0.67	1.00		0.00

*Optimal combination of sensitivity and specificity, based on Youden Index (sensitivity + specificity-1).

3.3: Result – Psychosocial Outcome Measures (Aim 3)

For aim 2 crosstabulation analysis was used as it allows for two variables to be compared and reports percentages for the number of respondents in each cell of table. Accordingly, psychosocial outcome measure (i.e., K-10, SF-12, and PWI, variable 1) and the CUDIT-R cut-off scores (variable 2) were used in a crosstabulation to record the number (frequency) of respondents that had specific characteristics in the cells of the table. Table 14 shows the results of the crosstabulation analysis and reports the percentages for the number of respondents in each cell.

The K-10 is presented in the severity thresholds (low, mild, moderate, and severe), which relate to the severity of psychological distress (mental disorder experienced). As seen in Table 14 less than 10% of individuals who experience mild cannabis use disorder (DSM-5) experienced moderate-severe psychological distress (K-10) and 29% of individuals who meet the criteria for cannabis dependency (DSM-IV)/ moderate/severe cannabis use disorder (DSM-5) experienced moderate-severe psychological distress (K-10).

As the PWI and SF-12 do not have pre-determined severity cut-off thresholds, the severity of symptoms was presented in terms of score below the mean. Specifically, as shown in Table 14 the PWI presented as one and two SD above (+1SD =87; +2SD =100) and below (-1SD= 63; -2SD=50) the normative values (M= 75, SD= 12.5). According to the PWI results less than 20% of individuals who meet the criteria for mild cannabis use disorder (DSM-5) experienced impaired psychological wellbeing and more than 99% who meet the criteria for Cannabis dependence (DSM-IV) moderate/severe cannabis use disorder (DSM-5) experienced impaired psychological wellbeing.

Table 14 displays values for the SF-12 PCS at one and two *SD* above (+1*SD*= 59; +2*SD*= 69) and below (-1SD=40; -2SD= 30) the PCS normative values (*M*=49; *SD*=10). Table 14 also displays values for the MCS at one and two *SD* above (+1*SD*=61; +2*SD*= 70) and below (-1SD=43; -2SD= 34) the MCS normative values (*M*= 52; *SD*= 9). As seen in Table 14, 50% of individuals who meet the criteria for mild cannabis use disorder (DSM-5) will experience physical impairments (PCS) and 20% experienced mental health impairments (MCS). Additionally, less than 60% of individuals who meet the criteria for Cannabis dependence (DSM-IV) moderate/severe cannabis use disorder (DSM-5) experienced physical impairments (PCS) and less than 85% experienced mental health impairments.

Table 14

Crosstabulation Analysis of the Psychosocial Outcome Measures and CUDIT-R Cut-off Scores

Scale *	< 9 CUDIT-R No diagnosis	9-12 CUDIT-R Mild cannabis use disorder (DSM-5)	>/=13 CUDIT-R Moderate-severe cannabis use disorder (DSM-5) cannabis dependence (DSM-IV)
K-10: low	72%	78%	47%
K-10: mild	11%	16%	24%
K-10: moderate	8%	4%	12%
K-10: severe	9%	2%	17%
PWI: 1*SD*	61%	18%	20%
PWI: -1*SD*	37%	18%	45%
PWI: 2*SD*	58%	18%	24%
PWI: -2*SD*	23%	23%	55%
SF-12 (physical component): 1*SD*	54%	18%	28%
SF-12 (physical component): -1*SD*	29%	14%	57%
SF-12 (physical component): 2*SD*	54%	18%	28%
SF-12 (physical component): -2*SD*	na	na	na
SF-12 (mental component): 1*SD*	57%	19%	25%
SF-12 (mental component): -1*SD*	38%	14%	48%
SF-12 (mental component): 2*SD*	54%	18%	28%
SF-12 (mental component): -2*SD*	55%	9%	36%

*K-10- The Kessler Psychological Distress Scale (low, mild, moderate, severe - categories of psychological distress); PWI – The Psychological Wellbeing Inventory (1*SD* and -1*SD* one standard deviation above and

below the mean, 2*SD*, -2*SD* two standard deviation above and below the mean); SF-12 – Short Form-12 Health Survey (1*SD* and -1*SD* one standard deviation above and below the mean, 2*SD*, -2*SD* two standard deviation above and below the mean).

Chapter 4. Discussion

Cannabis use and misuse are serious public health concerns worldwide (Bashford et al., 2010). Accordingly, cannabis screening is crucial as it enables early detection of cannabis use problems, which may prevent the escalation of further cannabis use and potential dependence (Bashford et al.). The most effective cannabis screens are identified as being short, easily understood by the client, simply scored by the clinician, and provide reliable information to the clinician to decide whether further assessment and intervention is required, such as the CUDIT-R (Bashford et al., 2007.). The CUDIT-R is a highly acceptable, reliable, and brief cannabis screener, which as the present study has found is suitable for use with both community and clinical populations. The current results provide valuable information regarding community based CUDIT-R cut-off scores based on the DSM-IV and DSM-5, as well as providing an indication of potential psychosocial impairments at specific severity thresholds (e.g., K-10; low, mild, moderate, and severe). The aim of the current study was first to determine CUDIT-R cut-off scores that were consistent with the DSM-IV and DSM-5 interpretation of cannabis dependence within a community sample, which was obtained through ROC; and secondly, to develop a means of clinical interpretation of CUDIT-R cut-off scores, in relation to psychological and psychosocial functioning, which was obtained through cross-tabulation analysis.

For maximum utility in opportunistic cannabis screening, a screen should discriminate diagnostic groups along the risk continuum, from high risk (likelihood of a dependence diagnosis), through to non-dependent, and moderate risk of developing dependence (risky use), to low risk, and no risk (Bashford et al., 2010; Dawe et al., 2002). Determining the

severity of cannabis dependence is important to assist in developing an appropriate treatment response (Dawe et al.). The results of the current research identified cut-off scores, which discriminated thresholds along a severity of risk continuum. Specifically, a cut-off score of 13 was the optimal criterion threshold for screening for cannabis dependence (DSM-IV) detecting 75% of individuals with a cannabis dependence diagnosis. A cut-off score of 9 was the optimal criterion threshold for screening for mild cannabis use disorder (DSM-5) detecting 76% of individuals with a mild cannabis use disorder diagnosis and is consistent with the DSM-5 diagnosis of Mild Cannabis Use Disorder (2 to 3 criteria are met). A cut-off score of 13 was identified for moderate-severe cannabis use disorder detecting 76%(moderate) and 84% (severe) cannabis use disorder diagnosis (DSM-5) and is consistent the DSM-5 diagnosis of moderate/severe Cannabis Use Disorder (where 4 to 5 criteria are met).

The cut-off score for both moderate and severe cannabis use disorder was identified as 13; there was no difference in the cut-off score between these two thresholds. There may be numerous ways of explaining perhaps the most likely is that there was not enough discrimination because the sample size for moderate and severe groups were potentially too small. The sample size may explain the uneven distribution between the threshold groups. For example, the severe use threshold group had a small amount of participants (n= 44), which may have made it less sensitive. However, the moderate category included even fewer participants (n= 30). Accordingly, it is unlikely that the inability for the current study to significantly differentiate between the moderate and severe categories was due to numbers of participants in each category and the sample size being too small overall. Therefore, future studies should look at accessing a greater sample size.

The results of the SDS showed a similar pattern. Specifically, a score of 10 or above on the CUDIT-R indicates the possibility of cannabis dependence and a cut-off score of 10 on the SDS is indicative of the standard adult cut-off of 3, which may also indicate possible cannabis dependency (note: SDS range 0-15 indicating minimum to maximum severity of cannabis dependence respectively). . Most participants (91%) obtained low SDS scores between 0 to 6 indicating that in general they had a low severity of cannabis dependence, with only 9% of participants scoring between 7 and 15. Again, more heavy cannabis users would have been beneficial in identifying high-risk categories. The SDS provides a valid source of concurrent validity with the CUDIT-R as both instruments are identified as measuring the same construct, cannabis dependence. Specifically, the SDS has a strong correlation with the DSM-IV (r= 0.65) and the DSM-5 (r= 0.80).

Adamson et al. (2010) identified an optimal cut-off of 13 (being preliminary only) as indicating possible cannabis use disorder. Adamson et al. also reported that any score under 13 should not be discounted as non-problematic/hazardous cannabis use, and a cut-off of 8 was identified as indicating problematic/hazardous use, which related specifically to sub-threshold cannabis use. The cut-off scores of 13 identified by Adamson et al. with a clinical treatment population is consistent with the moderate-severe cut-off score identified in the current research with a community population. This indicates that the same cut-off score can be used with community and clinical populations to indicate possible moderate-severe cannabis use disorder. This research has been an important first step in validating the CUDIT-R for use in a community setting and is the first of research in the field to achieve this with an Australian community sample. Additionally, a cut-off score of 13 was also identified for Cannabis Dependency (DSM-IV). Therefore, there is no difference in cut-off

scores between community and clinical population on the CUDIT-R when using DSM-IV criteria.

However, the sub-threshold cut-off score identified by Adamson et al. of 8 indicating problematic/hazardous cannabis use is inconsistent with the current research, which found 9 to be an optimal cut-off for mild cannabis use disorder. Accordingly, different cut-off scores are identified for community and clinical populations at mild cannabis use or problematic/hazardous cannabis use. This may be explained in one of two ways. Firstly, clinical and community populations may differ in severity at lower levels of cannabis use. Specifically, it may be the case that clinical population experience greater problems with low level cannabis use than community samples, which is accounted for by a lower cut-off score. Alternatively, the difference in cut-off scores between the community and clinical populations may be a result not in the samples, but differences between the DSM-IV and DSM-5, specifically regarding the DSM-5 being more sensitive and identifying sub-threshold 'diagnostic orphans'. Moreover, if the DSM-5 was used to identify cut-off scores on the CUDIT-R with a clinical sample as opposed to the DSM-IV, the cut-off of 8 may change to reflect the changes made between manuals. However, this remains unclear and an area for future research.

Comparisons with other reports of cannabis use in Australia are difficult. However, the prevalence estimates of dependence in the current study compare well with other Australian and New Zealand estimates (Anthony, Warner, & Kessler, 1994; Fergusson & Horwood, 1997; Coffey, Carlin, Degenhard, Lynske, Sanci, & Patton, 2002). Specifically, in the current study high frequency of symptoms reflected compulsive or an inability to cut down on cannabis use, with almost one third of participants reporting a persisting desire to use cannabis. Moreover, continued use despite knowledge of cannabis use causing physical

and/or psychological problems was endorsed by almost one third of participants. Unlike other studies (Coffey et al., 2002) that have found tolerance to be far less common than withdrawal amongst cannabis users, the current research indicated that the experience of tolerance exceeded the experience of withdrawal, with over one third of participants endorsing the experience of tolerance to cannabis. This may possibly be explained by the sample. For example, Coffey et al's sample consisted of only young Australian adults (*M*=21 years old, *range* 20 to 21 years old), whereas the current sample consisted of a wider age range (*M*=27 years old, range 18 to 64 years old).

The Psychosocial Outcome Measures

It is important to understand the psychosocial impacts of cannabis use in order to better understand the function and target of intervention to manage and prevent escalation of further dependence (Copeland et al., 2001). The psychosocial outcome measures used in the current research assisted in identifying possible psychosocial impairments at specific CUDIT-R severity threshold, which can be used by healthcare workers to draw inferences about possible psychosocial impairments the user may currently be experiencing. These statistics provide an indication of the potential percentage of people who will experience impairments in specific areas of psychosocial functioning across the CUDIT-R cut-off scores. This is important information as it can guide healthcare professionals as to what psychosocial impacts may be expected at different levels of cannabis dependence, as well as informing the development of interventions aimed at better management and providing healthcare workers with some insight into the user's functioning.

The current research was consistent with previous research (Coffey et al., 2001; Coscone, Zimmermann, Auckenthaler, & Robert-Tissot, 2011) that has focused on the psychosocial impacts of cannabis use. Overall the current research identified that individuals

who are dependent on cannabis may have a wide-range of additional psychosocial problems, such as: emotional and psychological distress, which increase with moderate – severe cannabis use dependence; physical and mental health impairments, which are more impaired with the high cannabis use severity; and impaired wellbeing in autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance with higher levels of cannabis severity. The K-10, SF-12, and the PWI percentages should be used as a guide as to the percentage of people who may experience these impacts across the severity thresholds.

Table 15 shows an interpretation of the psychosocial outcome measures at CUDIT-R severity thresholds. Specifically, individuals who score 9 or below (no diagnosis) on the CUDIT-R are likely to experience/report no to mild impairments on their psychosocial functioning. However, the level of impairment will depend on population norms and should be assessed in accordance to this. Simple advice about cannabis use should be provided. Individuals who obtain a CUDIT-R score between 9-12 (mild cannabis use disorder) are likely to observe greater psychosocial impairments. For example, approximately 10% of cannabis users reported experiencing moderate – severe psychological distress, approximately 20% of individuals experienced impaired psychological wellbeing, 50% reported physical health impairments, and approximately 20% reported experiencing mental health impairments. Accordingly individuals who obtain a CUDIT-R of 9-12 should be provided with simple advice, brief substance use intervention, and regular monitoring.

Finally, individuals who score 13 and above on the CUDIT-R, which refers to cannabis dependence in the DSM-IV and moderate/severe cannabis use disorder in the DSM-5, are likely to experience the greatest impairments to their psychosocial wellbeing. Specifically, approximately 30% of individuals who obtained a CUDIT-R score of 13 also

reported experiencing moderate to severe psychological distress, almost all individuals who obtained this score also reported impairments to psychological wellbeing (99%), approximately 60% reported physical impairments, and approximately 85% reported mental health impairments. Accordingly, for people who obtain a CUDIT-R score of 13 or above further treatment and evaluation is recommended.

The psychosocial results are beneficial as they help provide an indication of the amount of individuals who may experience different forms of psychosocial impairments at different CUDIT-R severity cut-off points. This information can be used to better understand possible impairments at each severity level and tailor interventions to prevent further dependence.

Table 15

Interpretation of the CUDIT-R Cut-Off Scores

CUDIT-R score	Severity threshold	Psychosocial outcomes and recommendations
<9	No diagnosis	Mainly with population norms
		Simple advice
9-12	Mild cannabis use disorder (DSM-5)	<10% moderate-severe psychological distress (K-10)
		<20% impaired psychological wellbeing (PWI)
		50% physical impairments (PCS)
		23% mental health impairments (MCS)
		Simple advice and brief intervention and monitoring
13+	Cannabis dependence (DSM-IV) moderate/severe cannabis use disorder (DSM-5)	29% moderate-severe psychological distress
		>99% impaired psychological wellbeing (PWI)
		<60% physical impairments (PCS)
		<85% mental health impairments (MCS)
		Further evaluation and treatment

In addition to the psychosocial measures of impaired functioning, the results obtained from the DSM-IV and DSM-5 in the current research also indicated that over half of the participants reported that their cannabis use had caused problems with their family or friends, had often lead to them being in unsafe situations, and had led to them cutting down on activities they once enjoyed such as school or work. These results are consistent with those identified by Coffey et al. (2002), who identified that cannabis dependence was associated

with social impairments, including difficulties with interpersonal relationships and maintaining motivation and interest in social activities.

Similar results were also reported by Cascone, Zimmermann, Auckenthaler, and Robert-Tissot (2011) in their research with a young Swiss adult population. Cascone et al. identified that the interpersonal difficulties with peers, school, and family need to be dealt with first in order to be able to influence cannabis-using behaviours. Accordingly, the current results provide invaluable information regarding the psychosocial difficulties associated with cannabis dependence. Therefore, practical interventions may be based around the knowledge of such impairments to enhance health and wellbeing. For example, psychosocial interventions may focus on interpersonal relationships and communication as an intervention to enhance individual's socialisation and social experiences prior to targeting the management of the cannabis use.

Methodological Limitations

The current results provide important information regarding CUDIT-R cut-off scores for cannabis use problems and possible psychosocial impairments at these cut-offs. However, the study is not without its limitations, which must be kept in mind when interpreting the results of the study. The current study had a good representation of participants across location and across age groups and obtained a larger sample size than both Adamson et al's. (2010) and Gossop et al. (1995). However, additional participants would have been beneficial to gain larger numbers in the psychosocial categories. Specifically, there was insufficient data in the SF-12 (physical component) -2*SD* category, and accordingly no data was produced for this category. Greater numbers in the psychosocial outcome measures may have influenced the results and may have provided data for each psychosocial outcome

category. Additionally, the majority of the participants were university students and identified as low-level cannabis users. Specifically, 54% of the current participants reported monthly use (1 to 4 times), or less than monthly use, while the rest 46% were using cannabis 1 to 4 or more times a week over the past 6 months. Accordingly, the data included a relatively small sample of high-risk cannabis users.

Another limitation was that although the online survey design employed in this research allowed for greater accessibility in a more time efficacy and less intrusive manner, it also resulted in incomplete survey, where the participants had either saved and not returned to the survey or dropped out half way through the survey. Additionally, as the data was based on self-report, it may have been subject to associated sources of bias, such as hesitancy to disclose information about illicit drug (cannabis) use (Bashford et al., 2010; Cheung et al., 2010). Accordingly, the use of online self-reports to diagnoses dependence was a potential limitation with the current study.

Directions for Future Research

There are often fundamental pitfalls in the use of psychometric instruments, which are sometimes overlooked in the clinical research literature (Hammond, 1995), One such problem has emerged with the CUDIT-R in terms of different item functioning across populations. The current study identified CUDIT-R community based cut-off scores for the DSM-IV, DSM-5, and a percentage of people who may experience possible psychosocial impairments at different CUDIT-R cut-off scores. However, research to date using the CUDIT-R is still largely based on psychometric data from clinical populations, which has

been obtained mostly from inpatient psychiatric populations and generalised to non-clinical populations.

As a result it is assumed that different populations, namely clinical populations and non-clinical populations, perform the same on the CUDIT-R. Accordingly, it is important to examine whether or not the likelihood of item (category) endorsement is equal across populations (Teresi et al., 2009). This is a major limitation of the CUDIT-R as there may be underlying differences on item endorsement between the populations, which are not being account for. If this is the case, this may have serious implications for the scoring and interpretation of CUDIT-R scores depending on the population being screened. Accordingly, this is an important area for future research. Additionally, additional research focusing on the psychosocial outcome measures may be beneficial is gaining more specific intervention. Moreover, further analysis, such as performing a chi-square analysis following the crosstabulation analysis would expand on the existing results and be of great benefit for future research.

Conclusions

Cannabis use is adversely impacting the health and social functioning of a larger and expanding cohort of adults and youth around the world (Bashford et al., 2010). Targeted, routine, and opportunistic screening with early intervention for cannabis problems has the potential for enormous gains in public health. The aims of the current study was to determine CUDIT-R cut-off scores that were consistent with the DSM-IV and DSM-5 interpretation of cannabis dependence within a community sample and to develop a means of clinical interpretation of CUDIT-R cut-off scores in relation to psychological and psychosocial functioning. The cut-off scores identified in the current study can be used by allied health

professionals to better identify levels of cannabis use severity, which may inform tailored interventions aimed at reducing the trajectory of further dependence. According to Bashford et al. the hallmark of a cannabis screener for early intervention incudes one that is reliable, time-efficient, and is in accordance with a valid classification of a broad range of cannabis related harms and problems; the CUDIT-R satisfies these criteria.

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List of Appendices

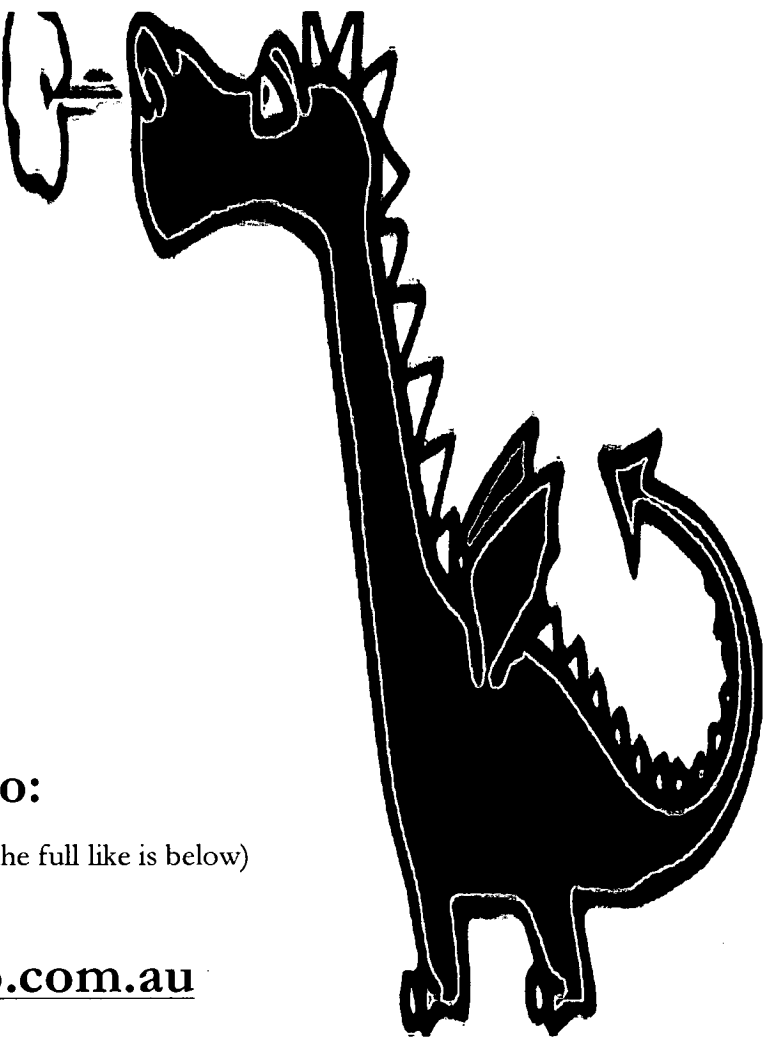
Appendix A1: Advertising Poster

Have you used cannabis in the past six months? If so you could WIN 1 of 3 $500 JB HIFI vouchers!

Jniversity of Tasmania researchers are looking for people to complete an anonymous online survey on the positive and egative effects of smoking cannabis and their general health and wellbeing.

f you are over the age f 18 and have used annabis in the past 6 onths then you can mplete the anonymous nline survey and enter ne prize draw to

<u>VIN 1 of 3 $500</u>
<u>B HIFI</u>
<u>ouchers!!</u>



To find out more head to:
<u>www. goo.gl/MRmNJ</u> (the full like is below)
Or email us at:
<u>cuditstudy_2011@yahoo.com.au</u>

his study has been approved by the Tasmania Social Sciences Human Research Ethics Committee H0012077. f you'd like to talk to someone about your cannabis use, try the cannabis information helpline on 180 30 40 50, vhich is a free call nationally. **The full web address for the study is ttps://surveys.psychol.utas.edu.au/index.php?sid=75648**

Appendix A2: Invitation used on Forums and Facebook

Have you used cannabis in the past 6 months?

Are you over the age of 18 years old?

Do you want the opportunity to WIN 1 of 3 $500 JB HiFi vouchers?

University of Tasmania researchers are looking for people who have used cannabis to complete an anonymous online survey. The survey takes approximately 40 minutes to complete and asks about the positive and negative effects of smoking cannabis and your general health and wellbeing. To find out more, head to this link: www. goo.gl/MRmNJ or email the researchers at: cuditstudy_2011@yahoo.com.au.

Appendix A3: Letters Inviting Australian Universities to Participate

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To whom it may concern,

Requesting Assistance Advertising Psychological Research

My name is Sophie Marshall and I am a Master of Psychology (Clinical) student at the University of Tasmania. I am writing to request your assistance with advertising our research on your campus in order to support us in recruiting a comprehensive sample of cannabis users in Australia.

Under the supervision of Dr. Raimondo Bruno (UTAS) and Dr. Simon Adamson (National Addiction Centre, New Zealand), my research project aims to develop clinical cut-off scores to aid in the interpretation of the Cannabis Use Identification Test – Revised (CUDIT-R), a brief screening tool for cannabis use problems that has applications in both primary medical care and psychological services. The study is designed to develop indicative cut-off scores (no dependency, mild dependency, moderate dependency, and severe dependency) that are consistent with the DSM-IV and DSM-5 definitions of cannabis dependency in a community sample. In addition, the study also aims to develop a means of clinical interpretation of these cut-off scores, in relation to psychological and psychosocial functioning and possible clinical intervention where required. To achieve this we have developed a 30-minute anonymous online survey, which along with the CUDIT-R, includes several standardised scales.

The study is open to all individuals over the age of 18, living in Australia, and who have smoked cannabis in the past six months.

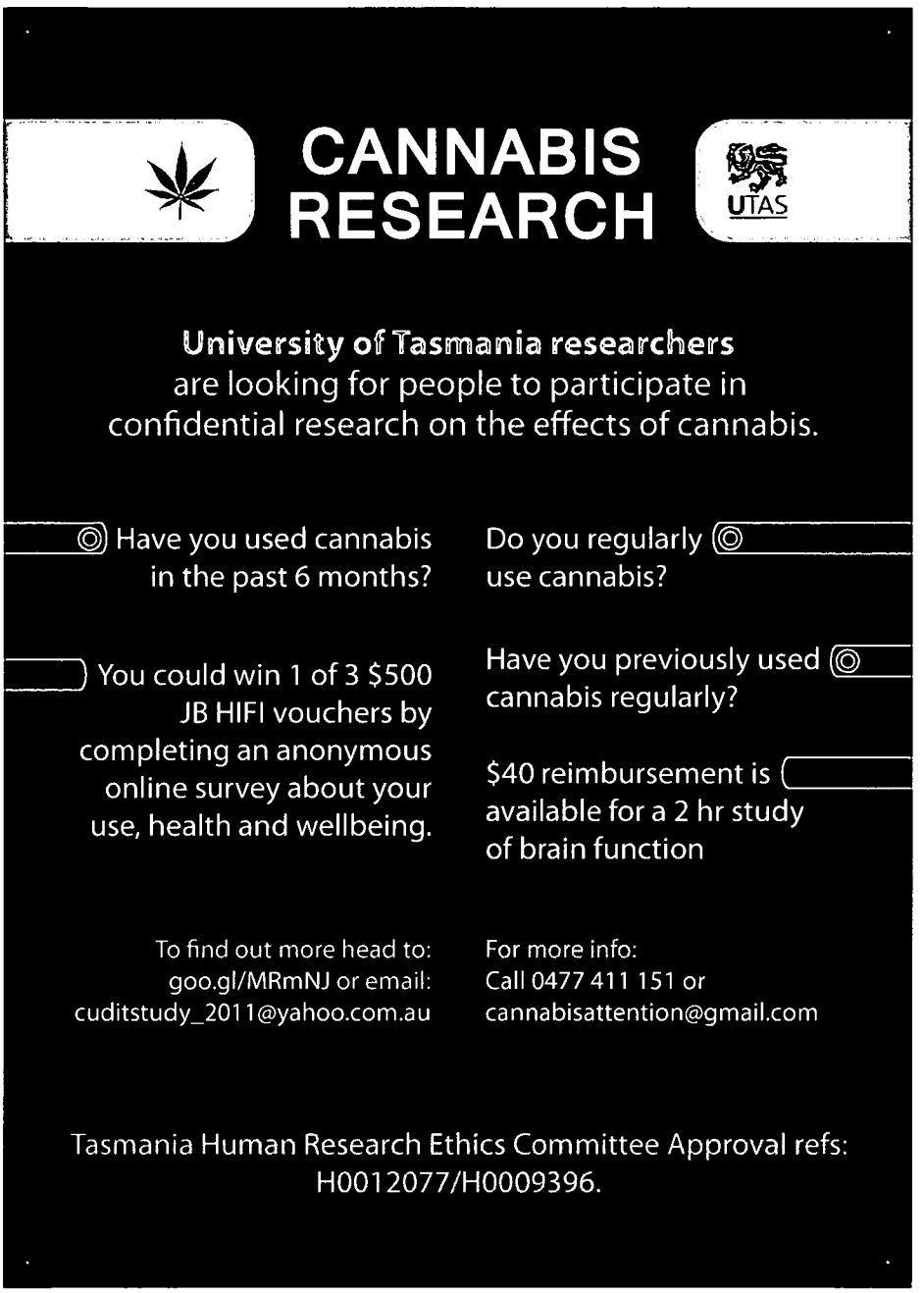
I hope that you will consider my request and assist us with advertising our research. **We have enclosed several copies of a promotional poster and would greatly appreciate it if you could place these on relevant bulletin boards in your school.**

For your information I have included the information sheet and recruitment poster with this letter. If you have any further questions in relation to this project please contact me at sophiem2@utas.edu.au or on 04262264956 to discuss how to proceed.

Thank you for your time,

Sophie Marshall | Provisional Psychologist

Appendix A4: Press Media Advertisement (wrap add)



Appendix B: Full Online Questionnaire

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1 [CR_Age]

How old are you? Please enter your age in years.

*

Please write your answer here:

268.

2 [CR_live]

Do you live in Australia?

*

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

A. ○ Yes
B. ○ No

3 [CR_sixmonths]

Have you used any cannabis over the past six months?

*

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Yes
- ○ No

4 [CR_exit]Thankyou for your interest in this research. This study is being conducted in partial fulfillment of a Masters degree for Sophie Marshall under the supervision of Dr. Raimondo Bruno at the University of Tasmania. Unfortunately you are not eligible to participate in this study because either:

- **You are not over the age of 18 years old;**
- **Do not live in Australia; or**
- **have not smoked cannabis in the past 6 months.**

Please contact the researchers by email cuditstudy_2011@yahoo.com.au if you would like more information.

Only answer this question if the following conditions are met:

DG

5 [gender] What is your gender?

Please choose the appropriate response for each item:

Male	Female	Transgender
○	○	○

6 [language] Do you speak another language other than English?

Please choose **only one** of the following:

- ○ Yes
- ○ No

7 [living] What state or territory do you currently live in?

Please choose **only one** of the following:

- ○ Tasmania
- ○ Victoria
- ○ New South Wales
- ○ Queensland
- ○ Western Australia
- ○ South Australia
- ○ Australian Capital Territory
- ○ Northern Territory

8 [school]Are you still in school?

Please choose **only one** of the following:

- ○ Yes
- ○ No

9 [grade] What grade are you in?

Only answer this question if the following conditions are met:

Please write your answer here:

10 [edu] What is the highest level of education you have completed?

Please choose **only one** of the following:

- ○ I did not go to school
- ○ Primary
- ○ Secondary

- ○ Highschool
- ○ College
- ○ University

11 [education] What is the highest qualification that you have completed?

Please choose **only one** of the following:

- ○ Trade-certificate
- ○ Non-trade certificate
- ○ Associate diploma
- ○ Bachelor degree
- ○ Higher than a bachelor degree
- ○ None

12 [employment] Which of the following best describes your current employment status?

Please choose **only one** of the following:

- ○ Self-employed
- ○ Employed for wages or payments
- ○ Unemployed
- ○ Looking for work
- ○ Solely engaged in home duties
- ○ A student
- ○ Retired or a pension
- ○ Volunteer or charity work
- ○ Unable to work
- ○ Other

13 [workcapacity] If you work, which best describes your work capacity?

Only answer this question if the following conditions are met:

Please choose the appropriate response for each item:

	Full time or Part time employment
Which best describes your work capacity?	

CUDIT-R

14 [frequency]How often do you use cannabis? *

Please choose **only one** of the following:

- ○ Never

- ○ Monthly or less
- ○ 2 to 4 times a month
- ○ 2 to 3 times a week
- ○ 4 or more times a week

15 [stoned] How many hours were you "stoned" on a typical day when you had been using cannabis? *

Please choose **only one** of the following:

- ○ Less than 1
- ○ 1 or 2
- ○ 3 or 4
- ○ 5 or 6
- ○ 7 or more

16 [cannabis]How often during the past 6 months... *

Please choose the appropriate response for each item:

...did you find that you were not able to stop using cannabis once you had started?
...did you fail to do what was normally expected from you because of using cannabis?
...have you devoted a great deal of your time to getting, using, or recovering from cannabis?
...have you had a problem with your memory or concentration after using cannabis?
How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children?

17 [cutting down] Have you ever thought about cutting down, or stopping, your use of cannabis? *

Please choose **only one** of the following:

- ○ Never
- ○ Yes, but not in the past 6 months
- ○ Yes, during the past 6 months

FOCU

18 [frequency_age]

How old were you when you the first time you used cannabis?

Please enter your age in years.

Please write your answer here:

•

19 [frequency_intake]What is your preferred method of cannabis intake?

Please choose **only one** of the following:

- ○ Joint
- ○ Bong
- ○ Dry pipe
- ○ Vaporiser
- ○ Eat (e.g., cookies)
- ○ Bucket
- ○ Other

20 [20c]

In the last 6 months have you used any synthetic cannabinoids (like Kronic, Spice, Karma, Voodoo, JWH)?

Please choose **only one** of the following:

- ○ Yes
- ○ No

21 [20d]How often have you had synthetic cannabinoids in the last 6 months?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Just once or twice
- ○ Every few months
- ○ About once a month
- ○ Once a week or more
- ○ Every day

22 [frequency_amount] On a typical day when you use cannabis, on average, how many cones, bongs, or joints do you normally have?

Please write your answer here:

•

Please put the number of cones, bongs, or joints that you have per day on average (e.g., if you smoke 10 bongs, put "10" in the box provided, without the quotation marks)

23 [20a]for your previous answer, were you counting the number of...

Please choose **only one** of the following:

- ○ Cones
- ○ Bongs
- ○ Joints
- ○ Other

24 [20b]Recently, about how many cones would you get from 1 gram of cannabis?

Only answer this question if the following conditions are met:

Please write your answer here:

25 [frequency_received] Please indicate how you have typically accessed cannabis over the past 6 months.

Please choose **only one** of the following:

- ○ Purchased it from a friend
- ○ Paid for it from a dealer/supplier
- ○ Have been given it
- ○ Have own supply
- ○ Other

26 [frequency_pay] If you pay for cannabis, how much have you spent over the past 4 weeks on cannabis?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ $0
- ○ $25
- ○ $25-$50
- ○ $50 -$100
- ○ $100-$150
- ○ $150-$200
- ○ $200-$300
- ○ More than $300

27 [frequency_6mnths]How has cannabis affected your finances in the last 6 months?

Please choose the appropriate response for each item:

In the past 6 months, have you spent money that was meant for other things (e.g., rent) on cannabis ?
In the past 6 months, have you sold any of your belongings to buy cannabis?
Do you have any drug realted debts?
Do you find yourself making excuses about money?
Have you found yourself worried about the amount of money you spend on cannabis?

28 [frequency_services] Have you ever accessed services (e.g., General Practitioner or drug services) for your cannabis use?

Please choose **only one** of the following:

- ○ Yes
- ○ No

29 [frequency_treatment] if Yes, what is the main type of drug treatment you are

currently in?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Not in treatment currently
- ○ Residential rehabilitation
- ○ Therapeutic community
- ○ Narcotics Anonymous
- ○ Drug counselling
- ○ Internet services (e.g., online counselling or forums)
- ○ Other

30 [frequency_treatforms]What forms of treatment have you been in over the last 6 months?

Only answer this question if the following conditions are met:

Please choose **all** that apply:

- ☐ Haven't been in treatment in the last 6 months
- ☐ Residential rehabilitation
- ☐ Therapeutic community
- ☐ Narcotics anonymous
- ☐ Drug counselling
- ☐ Internet services (e.g., online counselling or forums)
- ☐ Other:

DV

31 [DSM-V]The following questions are asking about your cannabis use over the past 6 months. ***In the last 6 months, did you....***

Please choose the appropriate response for each item:

...have job or school troubles as a result of your cannabis use? (e.g. missing too much work, not doing your work well, being demoted, or being suspended, or dropping out of school)
...have a period when your cannabis use (or recovering from your cannabis use) often interfered with taking care of your home or family?
...accidently injure yourself while under the influence of cannabis? (e.g. have a bad fall, cut yourself badl hurt in a traffic accident where you were driving)
...more than once drive a car, motorcycle, truck, boat, or other vehicle when you were under the influence of cannabis?
...find yourself under the influence of cannabis or feeling its after-effects in situations that increased your chances of getting hurt? (e.g. swimming, using machinery, or walking in a dangerous area or around heavy traffic)

...get arrested, held at a police station or have any other legal problems because of cannabis use?
...have arguments with your spouse, boyfriend/girlfriend, family, or friends as a result of your cannabis use?
...get into physical fights while under the influence of cannabis?

32 [ABu2]

Only answer this question if the following conditions are met:

Please choose the appropriate response for each item:

...continue to use cannabis even though you knew it was causing you troubles with your family or friends?

33 [DSMV2]*In the last 6 months, did you....*

Please choose the appropriate response for each item:

	Yes	No
...more than once want to stop or cut down on using cannabis?	○	○

34 [DSM-V3]

Only answer this question if the following conditions are met:

Please choose the appropriate response for each item:

...more than once try to stop or cut down using cannabis but found you couldn't do it?

35 [DSMV4]The following questions are asking about your cannabis use over the past 6 months. *In the last 6 months, did you....*

Please choose the appropriate response for each item:

...often use cannabis in larger amounts or for a much longer period than you meant to?
...have a period of a month or more when you spent a lot of time using cannabis or getting over its bad after-effects?
...have a period of a month or more when you spent a lot of time making sure you always had enough cannabis available?
...find that your usual amount of cannabis had much less effect on you than it once did?
...find that you had to use much more cannabis than you once did to get the effect you wanted?
...give up or cut down on activities that were important to you in order to use cannabis like work, school, or associating with friends or relatives?
...give up or cut down on activities that you were interested in or that gave you pleasure in order to use cannabis?

36 [DSMV5]

Only answer this question if the following conditions are met:

Please choose the appropriate response for each item:

	Yes	No
Did this (giving up on activities) happen 3 or more times for a month or more?	○	○

37 [DSMV6]*In the last 6 months, did you....*

Please choose the appropriate response for each item:

...continue to use cannabis even though it was making you feel depressed, uninterested in things, or suspicious and distrustful of other people?
...continue to use cannabis even though you knew it was causing you a health problem or making a health problem worse?

38 [DSMV7]*In the last 6 months, did you have any of the following bad aftereffects when the effects of cannabis were wearing off?* This includes the morning after using it or in the first few days of stopping or cutting down on it. *Did you....*

Please choose the appropriate response for each item:

	Yes	No
...feel depressed?	○	○
...feel yourself sweating or your heart beating fast?	○	○
...have the chills?	○	○
...have a fever?	○	○
...feel anxious or nervous?	○	○
...have stomach aches, cramps or diarrhoea?	○	○
...become so restless you fidgeted, paced or couldn't sit still?	○	○
...find youself sweating, your pupils dilating or your hear standing up?	○	○
...have trouble falling asleep or staying asleep?	○	○
...have bursts of anger or being aggressive?	○	○
...find yourself shaking?	○	○
...have very bad headaches?	○	○
...becomre irritated more easily than usual?	○	○
...eat less than usual or lose weight?	○	○
...have a strong craving for more cannabis?	○	○

39 [DSM8]*In the last 6 months...*

Only answer this question if the following conditions are met: °

Please choose the appropriate response for each item:

...was there ever a time where two or more of these problems occurred together for two days or more because of stopping, cuttign down on, or going without cannabis?
40 [DSM9]*In the last 6 months, did you....*

Please choose the appropriate response for each item:

...take more cannabis or a similar drug to get over or avoid any of these bad aftereffects?
CEQ

41 [expectancy]

The following questions ask about what impact cannabis has on you. Please indicate how true each statement is for you.
Please choose the appropriate response for each item:

I get better ideas when smoking cannabis
Little things annoy me less when I am smoking cannabis
I am more worried about what others are saying about me when I am smoking cannabis
Smoking cannabis makes me feel outgoing and friendly
Smoking cannabis makes me feel tense
I have more self-confidence when smoking cannabis
I have bizarre or strange thoughts when smoking cannabis
I smoke cannabis to get full enjoyment out of life
Smoking cannabis makes me more sexually responsive
Smoking cannabis makes me confused
I am more aware of what I say and do when I am smoking cannabis
I feel restless when smoking cannabis
I am more depressed when smoking cannabis
Smoking cannabis makes me feel sluggish
When I smoke cannabis I withdraw from others
When I smoke cannabis it is easier to express my feelings
Smoking cannabis increases my tension
When I smoke cannabis I find it hard to get certain thoughts out of my head
When I smoke cannabis I feel less motivated
Smoking cannabis makes me laugh
I tend to adopt a "who cares" attitude when smoking cannabis
Smoking cannabis makes me more easily irritated
I feel less shy if I have been smoking cannabis
Smoking cannabis helps me to feel "normal" again
When I smoke cannabis my mood feels flat
Smoking cannabis makes me happy
Smoking cannabis helps me concentrate
When I am smoking cannabis I avoid people or situations for fear of embarrassment
When I smoke cannabis I can speak my mind
I am disappointed in myself when smoking cannabis
I tend to avoid sex if I have been smoking cannabis
I am clumsier when smoking cannabis
Cannabis helps me to get along with others
Smoking cannabis makes me feel insecure
When smoking cannabis I do things that I do not really mean to do
I have more energy when smoking cannabis
I lose most feelings of sexual interest after I have been smoking cannabis

Cannabis makes me feel more jumpy and agitated
When I smoke cannabis I feel "panicky"
Smoking cannabis makes me feel excited
When smoking cannabis I have thoughts that are not my own
When smoking cannabis my feelings rapidly shift from one to another
Smoking cannabis gives me more energy
When smoking cannabis people find it difficult to understand me
When smoking cannabis I feel out of touch with reality

SDS

42 [Severity concerned]In the last 6 months...

Please choose the appropriate response for each item:

Did you ever think your use of cannabis was out of control?
Did the prospect of missing a smoke make you very anxious or worried?
Did you worry about your use of cannabis?
Do you wish you could stop using cannabis?

43 [Severity_stopping] How difficult would you find it to stop or to go without cannabis?

Please choose **only one** of the following:

- ○ Not difficult
- ○ Quite difficult
- ○ Very difficult
- ○ Impossible

K-10

44 [k-10] Please indicate what best represents how you have been over the past month. ***During the last month, about how often did you....***

Please choose the appropriate response for each item:

...feel tired out for no good reason?
...feel nervous?
...feel so nervous that nothing could calm you down?
...feel hopeless?
...feel restless or fidgety?
... feel so restless you could not sit still?
...feel depressed?
...feel that everything was an effort?
...feel so sad that nothing could cheer you up?

...feel worthless?

45 [MHQC]The following questions ask about things in the last 6 months

Please choose the appropriate response for each item:

Have you ever had any mental health problems in the last 6 months, such as depression, anxiety, or psychosis? This includes any issues that you haven't spoken to a health professional about.
Have you attended an appointment with a health professional for mental health problems in the last 6 months?
Have you been prescribed any medication for a mental health problem in the past 6 months?

46 [MHDX]What was this mental health problem (or problems)?

Only answer this question if the following conditions are met:

Please choose **all** that apply:

- ☐ Depression
- ☐ Anxiety or panic
- ☐ Schizophrenia
- ☐ Post-traumatic stress disorder
- ☐ Other:
-

SF-12

47 [SF_health] In general would you say your health is:

Please choose **only one** of the following:

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

48 [SF_activities]The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

Please choose the appropriate response for each item:

Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf or climbing several flights of stair.

49 [SF_6mnths]During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

Please choose the appropriate response for each item:

	Yes	No
Accomplished less than you would like	○	○
Were limited in the kind of work or other activities	○	○

50 [SF_4emot]During the past 4 weeks, have you had any of the following problems

Not at all A little bit Moderately Quite a bit Extremely

with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

Please choose the appropriate response for each item:

	Yes	No
Accomplished less than you would like	○	○
Did work or other activities less carefully than usual	○	○

51 [SF_housework]During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Please choose the appropriate response for each item:

52 [SF_outcomes]

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the past 4 weeks...

Please choose the appropriate response for each item:

Have you felt calm and peaceful?
Did you have a lot of energy?
Have you felt downhearted and blue?

53 [SFlast]During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

Please choose the appropriate response for each item:

NHHS

54 [alcohol]

The following questions are interested in your experience with drugs other than cannabis in the last six months

How often do you have a drink containing alcohol?

Please choose **only one** of the following:

- ○ Never
- ○ Monthly or less
- ○ 2 to 4 times a month
- ○ 2 to 3 times a week
- ○ 4 or more times a week

55 [alcohol_howmany] How many standard drinks do you have on a typical day when you are drinking?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ 1 or 2
- ○ 3 or 4
- ○ 5 or 6
- ○ 7 to 9
- ○ 10 or more

56 [alcohol_six+]How often do you have six or more standard drinks on one occasion?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Never
- ○ Less than monthly
- ○ Monthly
- ○ Weekly
- ○ Daily or almost daily

57 [tobacco]Do you smoke tobacco? (this includes tobacco mixed in with cannabis)

Please choose **only one** of the following:

- ○ Yes
- ○ No

58 [tobac2]How often did you smoke tobacco?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Daily
- ○ At least weekly (but not daily)
- ○ Less often than weekly

59 [tranquillisers]Have you used tranquillisers and/or sleeping pills (e.g. benzos, valium, alprazolam, temazepam) for non-medical purposes in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

60 [tranquilisers_howoft]In the last 6 months, how often did you use tranquilisers/sleeping pills for non-medical purposes?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

61 [LSD] Have you used Hallucinogens/LSD/Magic Mushrooms in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

62 [LSD_howoften]In the last 6 months, how often did you use Hallucinogens/LSD/Magic Mushrooms?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

63 [meth] Have you used Meth/amphetamine in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

64 [meth_howoften]In the last 6 months, how often did you use Meth/amphetamine?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

65 [heroin]Have you used heroin in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

66 [heroin_howoften]In the last 6 months, how often did you use heroin?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

67 [methadone]Have you used Methadone/buprenorphine for non-medical purposes in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

68 [methadone_howoften]In the last 6 months how often did you use Methadone/buprenorphine for non-medical purposes?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

69 [opioids]Have you used other opioids (e.g., morphine, oxycodone) for non-medcial purposes in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

70 [opioids_howoften]

How often did you use other opioids for non-medical purposes in the last 6 months?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

71 [cocaine]Have you used Cocaine in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

72 [cocaine_howoften]In the last 6 months how often did you use Cocaine?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

73 [ecstasy]Have you used Ecstasy in the last 6 months?

Please choose **only one** of the following:

- ○ Yes
- ○ No

74 [ecstasy_howoften]In the last 6 months, how often did you use Ecstasy?

Only answer this question if the following conditions are met:

Please choose **only one** of the following:

- ○ Every day
- ○ Once a week or more
- ○ About once a month
- ○ Every few months
- ○ Once or twice

PWI

75 [wellbeing]

The following questions ask how satisfied you feel, on a scale from zero to 10. Zero means you feel completely dissatisfied. 10 means you feel completely satisfied. And the middle of the scale is 5, which means you feel neutral, neither satisfied nor dissatisfied.

Thinking about your own life and personal circumstances, *how satisfied are you....*

Please choose the appropriate response for each item:

...with your life as a whole?
...with your standard of living?
...with your health?
...with what you are achieving in life?
...with your personal relationships?
...with how safe you feel?
...with feeling part of your community?
...with your future security?
...with your spirituality or religion?

Appendix C1: Information Sheet

Thank you for your interest in this research. This study is being conducted in partial fulfillment of a Masters degree for Sophie Marshall under the supervision of Dr. Raimondo Bruno at the University of Tasmania.

Before you decide to participate, it is important for you to understand why the research is being done and what it will involve.

Please take time to read the following information carefully.

Please contact the researchers by email **cuditstudy_2011@yahoo.com.au** if you would like more information.

1. What is this study about?

This study aims to better understand the development of dependence to cannabis. In particular, we aim to better understand the possible positive and negative psychological, health, and social implications that may occur at different degrees of cannabis use and dependency (i.e., people with no problems, mild problems and clear dependence to cannabis). This study will help with the development of ways of identifying cannabis problems early and the interventions needed to manage cannabis dependence.

You are invited to participate in this study:
269. if you are over the age of 18 years old;
270. live in Australia; and
271. have used cannabis in the past 6 months.

2. What will I be asked to do?

As a participant in this survey, you will be asked to complete an anonymous online survey on the positive and negative effects of smoking cannabis, including questions regarding your health, lifestyle, other drug use, physical health, mental health, and social interaction. This will take about 30-40 minutes to complete. It is important that you understand that your involvement in this study is voluntary. If you decide to discontinue participation at any time, you can do so by simply closing your web browser. No information will be submitted to the researchers until you have completed the survey.

3. Where will the data be kept?

All of the survey information/data we obtain from participants will be kept on a password-protected computer in the School of Psychology, University of Tasmania, for a period of five years.

4. How will the data be kept secure?

All survey data will be stored on a password-protected computer.

5. How and when will the data be destroyed?

After the study is published all data relating to the study will be electronically stored for five years. After this period, or when the data is no longer of use, all survey data will be deleted.

6. Are there any possible benefits from participation in this study?

Participating in this study may result in individuals having a greater understanding of their cannabis use and the possible effects that this may have on their wellbeing. By participating in this study, you are providing important and valuable information in an area of research that is relevant to you. Your participation will help us gain important information that will assist us to better understand the positive and negative effects that Australians experience from their cannabis use and how this relates to different levels of use as well as among those with dependence problems. This information will be valuable in the development of community intervention programs aimed at reducing the harms some people experience with cannabis use.

Additionally, to thank you for your time, upon completion you may choose to **enter a draw to win one of three $500 JB-HiFi gift vouchers!**

7. Are there any possible risks involved in participating in this study?

There are no specific risks anticipated with taking part in this study. However, should you become uncomfortable or upset whilst completing the survey, or feel you'd like to talk to someone about your cannabis use, below are some contact details of services that are available 24 hours a day, 7 days a week:
Cannabis Information & Helpline: 1800 30 40 50
Counselling Online: www.counsellingonline.org.au
Beyondblue: 13 11 11

8. How will your confidentiality and privacy be protected?

None of the questions asked in the questionnaire will provide information that could directly identify you as an individual, and you are free to decline to answer any question you are not comfortable with. We do not collect your IP address or referrer URL, neither do we timestamp your answers. To protect the security of transmission of information between your computer and our server, our server uses an encryption which is backed by AusCERT certificate with 2048 bits long key. This is the same level of encryption used by banks and the Australian Tax Office, which means that your data cannot be intercepted during transmission. As a further degree of protection, you may also choose to use an anonymiser, which will mask your IP address. This will mean that the computer you are using will be unidentifiable.

Anonymisers work by inserting a 'fake computer' between your computer and our server, therefore masking your IP address. For more information see: **http://proxy.org** . Together, these steps mean that your data can be safely provided anonymously.

9. What if I have questions or concerns about this research?

If you would like to discuss any aspect of this study please feel free to contact either of the researchers by email at cuditstudy_2011@yahoo.com.au. If you would like to view the results of this research, this can occur at the conclusion of this research and the results will be published online at the survey website. Additionally, if you require further information or want to discuss the results, you may email the researchers.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study you can contact the Executive Officer of the HREC (Tasmania) Network on +61(0)36226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote **H0012077.**

Appendix C2: Consent Form

How do I participate?

By clicking the button below, you indicate that you have read the information on this page and you are agreeing to participate in this research study. If you do not wish to participate, we thank you for your interest.

1. I have read and understood the 'Information Sheet' for this study.

2. I understand the nature and possible effects of this study.

3. I understand that this study involves answering questions about drug use, physical health, mental health, and social interactions.

4.I understand that all questions are optional and that I may choose to not answer any questions that I am uncomfortable with.

5. I understand that all research data will be securely stored on a password-protected server at the University of Tasmania.

6. I understand that my participation is voluntary and that I cannot be identified in any way.

I agree with the above statements and wish to participate in the survey.

There are 75 questions in this survey [I Agree]

Appendix C3: Prize Draw Invitation

Thank you for taking the time to complete the questionnaire, it is very much appreciated and the information you have provided will be very valuable to help the researchers better understand the effects cannabis has on peoples' functioning, health, and general wellbeing.

The researchers would like to now offer you the opportunity to **enter a prize draw to win one of three $500 JB Hi-Fi Gift Vouchers!**

By clicking on the "Enter Prize Draw" link below, you will be directed to a separate webpage where you will be asked to provide a valid, but anonymous email address. If you would not like to enter the draw simply exit this page. **Thank you once again for your time.**

If you would like to enter the prize draw, you may write your valid email account in the space provided below. Please note that to protect your anonymity, we request that you use an email account that is not connected to your name in any way. If required, you may create an anonymous free account by accessing www.hotmail.com or www.gmail.com.

Please type your anonymous email address in the box provided

Please re-type your anonymous email address in the box provided

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